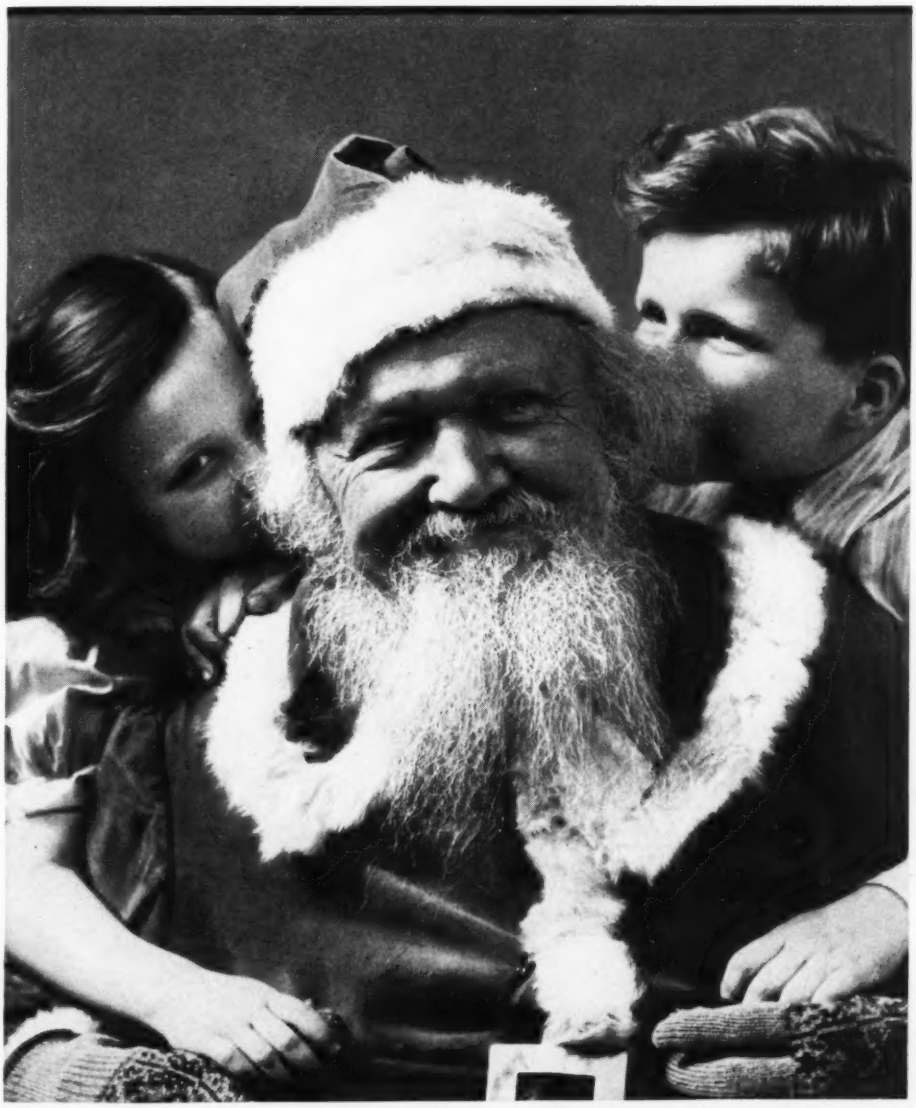
Better Crops with PLANT FOOD

December 1938 10 Cents



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AMERICAN POTASH INSTITUTE, INC.

INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

VOLUME XXII NUMBER TEN

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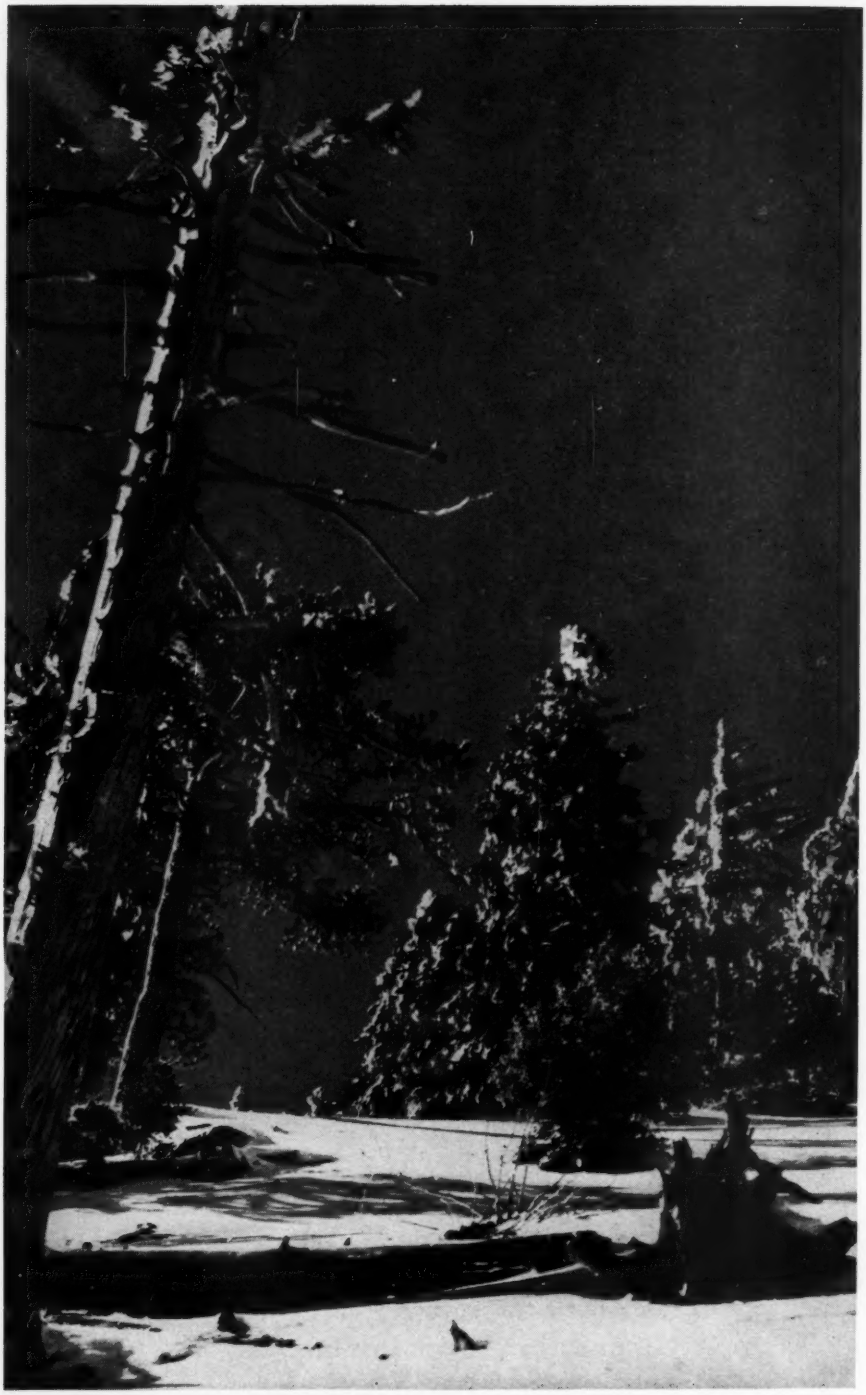

Even the unsightly takes on the eerie beauty of a winter's night.

Better Crops with PLANT FOOD

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VOL. XXII WASHINGTON, D. C., DECEMBER 1938 No. 10

Jeff reflects the glow from—

December's Embers

By Jeff McDermid

CHRISTMAS and New Year's are as dependable for staging a comeback as taxes, old-age pensions, and the Republican party. Here we have two universal anniversaries which do not alter their customs or mangle their traditions to suit a debunked era of skepticism. We do not mar them with our vociferous discussions on New Dealism; our personal inhibitions as to imaginary limitations; or our notions as to the rights and privileges of sex, racial stock, or years of experience and education.

Neither is Christmas the artificial creation of glory-puffing legislators, such as our acquired red letter days like Columbus Landing Day, Leif Ericson Day, Flag Day, and Labor Day. Likewise, the holly-wreathed holidays bear little of the commercial "sell-belly" stuffiness of our monstrous Cherry Weeks, Melon Months, Milk Marathons, Cheese Campaigns, and Potato Periods. 'Tis true we consume eatables and liquids up to the danger zone of dyspepsia and female embonpoint during the blessed Christmas interval, but there remains one distinction not to be overlooked.

In food surplus riddance races the objective is consuming tonnages to please the ad man and the campaign committee, while at winter holiday time we distend our alimentary canals to the

glory of brotherly love, reciprocity, and that fuller feeling for its own sake. If the candy hawker, the cranberry merchant, and the goose vender benefit betimes, it is a mere prosaicism incidental to that rich inner satisfaction of soul and succulence, so blissfully inseparable from the ending of December.

AH, the stewing and the baking, the basting and the ladling, which with accompanying delectable odors carry us both backward and forward—backward to our earlier years of old chums and big appetites, and forward toward another hunk of plum pudding! It is a time to punch new notches in your belt and sing praises to the talent of good cooks, whether academic or practical. It is a time to put on a few extra plates and be bountiful to guests, even though they are your wife's relations!

As we thatch our domes with gray, many of us entertain but feeble reactions to the theme of various holidays and celebrations. Time was when I was not satisfied with a Fourth's festivities unless I had made as much unseemly noise as a thunderstorm and finished the day with a burnt blouse and singed eyebrows. I have often felt frustrated and unhappy over a Hallowe'en where our gang did not hang a wheelbarrow in a tree or push over an unoccupied, family-sized three-holer.

But in some unaccountable way, both the feverish Fourth and the hobgoblin evening leave me untouched today by any lingering urge to patriotism or cunning pranks. Our lawmakers have deleted the noisiest firecrackers, and yet I do not nurse any grudge to "get them" for it at the polls. On October 31 our neighborhood youngsters only knock and present themselves in masks and frowzy bedsheets demanding "grub or trouble." I hand them cookies and praise them for their forbearance—secure in the knowledge that modern indoor plumbing keeps us safe from privy privation at any rate.

Thus age and changing custom, law and modern regulation have combined to sift out the original American spirit from many calendared occasions. But December's feast days stay the same.

If change there be in certain intangible ways, it lies within ourselves and not in the genuine graciousness surrounding the advent of the Christmas spell. Given fair health and normal expectations, there is real danger facing those who have no means within them to enjoy the Yuletide recess. For nothing short of tough arteries will skid a fellow faster on the road to senility than the acceptance of Christmas as just another morning to put on your pants and go after more profits. We can insult our souls and stultify every other holiday without much risk, but when you flaunt Santa you're ready for the sanitarium!

I DO not know who invented Christmas in the first place—maybe a sorrowful bunch of emaciated victims of Roman terrorism, or a few jolly priests in the snowy Alpine valleys of the Austrian Tyrol, or rotund Saxon barons bringing in the boar's head. It makes no real difference who plotted the idea, it has survived and withstood every adverse current from Metternich to Mussolini and from the Huns to Hitler!

If we admitted skepticism to the fireside, we might inject some nasty comment on the lack of Christmas spirit on every day except the sacred Twenty-fifth, but cold water has no place on our December embers.

For after you have sat quietly with your wife before the glowing hearth, surmounted by its holly fringe and row of hopeful hosiery, listening to carolers along some distant street, you are not so apt to blame the world for its sins as you are to thank it for its charity.

OF course, if you are a non-stop professional reformer, hell-bent for next election, or a dour, deacon-like individual anxious to redeem everybody else by Sunday, I am afraid you won't sit long with us by dying embers. You'll grab some of 'em out to heap on somebody's head. But Christmas is no

time for singed hair, here or hereafter. It is a time for happy humility and mutual respect, and the only intolerance we allow is intolerance of meanness.

So, although Christmas itself remains unaltered in its deeper meanings, I observe my own moods as I approach it

are changed as my own age and situation change with the years. Bear with me a little while and check this over with your own impressions and memories.

You recall that when we were very young the uplift of this holiday came to us largely because of the combination of delightful mystery and great personal expectations. Prior to my tenth year I had implicit faith in the jingling journeys of the snowy saint and did not let mere physical improbabilities shake my confidence. I may have wondered why he chose to crawl into a sooty chimney and tarnish his beard with creosote, when we always left the back door unlatched to accommodate a brother working on a night shift. I may have easily questioned the saint's uncanny ability to read my precious requests when I could hardly decipher the scrawl myself.

I may have casually conjectured what reason implied Santa to fetch me the same kind of sugar cookies cut with crinkly tins that I saw my mother bake two days before; or why some of his packages bore trade stamps from Arthur & Johnson's, when the north pole factory was owned and operated by the Great Giver. Even when at Sunday School gift night I caught our local blacksmith stuffing his bulky anatomy into a red suit trimmed with white braid and muttering against the unreality of cotton batting whiskers—even then I rebelled against growing unbelief!

This phase of our lives in relation to blessed beliefs is only a natural course in man's existence. That is, we usually believe what we wish most to believe, and we yield such opinions only when we find new points of view more adapted to present convenience or necessity. Santa never kidded us as kids like we can kid ourselves now, when we want to. Almost any election proves that.

THEN came the time when we put on long pants and had socks too short for Santa, when our voices were breaking and changing, when we got into the grammar school and the fifth ward gang; and fed on Cooper, Henty, Cap Merrywether, and Robert Louis Stevenson. We knew all there was to know and much more that couldn't be repeated. We were experiencing growing pains and calf love pangs—proud of black eyes and grubby knuckles but ashamed of our report cards or a bum catch at first!

Ranging afield with air gun and fish pole, pockets bulging with treasures acquired through artful barter or fortunate finding, chummy with freckled

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Legumes have performed miracles on Mississippi soils. This field made an excellent stand of bur clover.

Legumes Improve Mississippi Soils

By F. J. Hurst

Editor, Agricultural Extension Service, State College, Mississippi

MISSISSIPPI farmers are working miracles in increasing yields of major farm crops. They are restoring new life and adding humus and needed fertility to hundreds of thousands of acres of crop land, which through years of one-crop farming and the relentless toll of unchecked erosion have been depleted of their virgin fertility. And the remarkable thing about this restoration of fertility to starved and impoverished soils is the fact that it is being done out of thin air.

Legume crops are the magicians which Mississippi farmers are using to enrich the fertility of their soils. Nitrogen is one of the most necessary elements needed to grow crops, yet more than three-fourths of the air is nitrogen. Farmers are now growing legumes on a vast scale as a means of capturing some of the inexhaustible supply of free nitrogen in the air and putting it into their depleted soil to increase crop yields.

And when nitrogen-rich legume crops, like hairy vetch, Austrian winter peas, and bur clover are turned under, they not only add valuable nitrogen to the soil, but they add huge supplies

of organic matter, which increases the moisture-holding capacity of the land, gives new life to the soil, makes inert plant foods available, and increases crop yields.

Winter legumes also provide protection against erosion, which has taken such heavy toll of the fertile topsoil, plant food, and fertilizers. The leafy tops of legume plants break the force of falling raindrops. They form a thick blanket which helps to prevent surface run-off and to spread water evenly over the land so the soil can soak it up. Billions of tiny roots open passageways down to the soil that help to keep it porous and absorptive.

Soils Must Be Protected

Protection against the insidious inroads of erosion—probably the most destructive force threatening the foundation and permanency of agriculture—is vastly important to the State's agricultural rehabilitation.

A recent survey made by the Soil Conservation Service revealed that of the 46,000 square miles of land area in the State, only 15,925 square miles—approximately one-third of Mississippi's total area—could be reported as showing "little or no erosion." It was found that 8,373 square miles, or 18 per cent, showed "moderate sheet erosion," and that 12,592 square miles, or 27 per cent, showed "moderate sheet erosion with occasional gullies." The remaining one-fifth of the State was found to vary from "severe sheet erosion" to a condition which could be covered only by the report "destroyed by gullying."

While part of this alarming extent of erosion could be attributed to other factors, much of it was due directly to the fact that crop land had been left bare and unprotected during winter rains. Planted to clean cultivated crops during the summer and lacking a protective cover or root system during the winter, heavy rainfall has washed tons of fertile topsoil, valuable plant food, and fertilizers from the fields.

The thick growth of such winter cover crops as bur clover, hairy vetch, and Austrian winter peas holds the soil and protects the land from washing of winter rains. Planted in the early fall as soon as harvest has been completed, these winter legumes hold soil intact until the fields can be planted to other crops in the spring. Hence, winter cover crops have become one of the most important means Mississippi farmers are using to conserve and improve their soil. They supplement terracing, contouring, tree planting, pasture building, and retirement of steep slopes from cultivation in a multiple attack upon the conservation problem.

Unlike the other means used in the fight, however, legumes do more than protect the land; they add back much of that which has been lost. They not only save the land from further washing; they restore to the soil the humus and nitrogen taken from it by soil-depleting crops.

There is nothing new about the invisible forces put to work to make fertile soil. They have been stressed repeatedly for many years by county agents, extension specialists, farm lead-

County Agent Harris Barnes of Coahoma County showing the difference between the yield of cotton which was not preceded by vetch (left), and cotton which followed vetch (right).

ers, agricultural journals, the daily and weekly press. But only in recent years have farmers planted winter legumes on a big scale. There are probably a number of reasons for the rapid expansion in winter and summer legume acreage during the past 5 years. Probably the most important has been the remarkable increase in corn and cotton yields farmers have obtained after plowing under a good crop of winter legumes. Many farmers have actually doubled the yield of these two main crops following winter legumes. Many county agents have redoubled their efforts and improved their plans in getting farmers to plant more winter legumes. The offer of AAA payments for seeding and for plowing under legumes unquestionably has been an important factor in extending the acreage planted.

Fertilizer Increased Yield

Still another important factor, especially in the hill counties of the State, has been the fact that farmers learned how to grow these crops successfully. Many of them found out that the seed had to be inoculated and the crop had to be fertilized. Hundreds of field demonstrations show that the application of around 200 pounds of superphosphate, or 400 pounds of basic slag per acre, and the application of potash when needed has doubled and trebled the yield of hairy vetch and Austrian winter peas. And where plenty of phosphate and potash have been used under the winter legumes, it has not been necessary to apply these elements under the crops that follow.

In Mississippi the planting of winter legumes has increased from 5,000,000 pounds in the fall of 1934 to 9,000,000 pounds in 1935, to 14,416,295 pounds in 1936, and to 18,411,207 in 1937. Last winter Mississippi farmers had approximately 750,000 acres in legume cover crops, and in the spring of this year they turned under the largest crop of legumes ever planted in the State.

The planting of bur clover, especially in the delta, is increasing rapidly, in addition to the expansion in acreage planted to hairy vetch and Austrian winter peas. A record-breaking 5,604,000

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This field of corn, which followed a crop of bur clover, yielded more than 50 bushels per acre.

Does Weather Affect Tomato Yields?

By Victor A. Tiedjens

New Jersey Agricultural Experiment Station, New Brunswick, New Jersey

WEATHER, soil, and plant-food materials all play an important role in the production of tomatoes on the coastal plain soils. If you were to ask a grower whether he grew tomatoes in 1938, it is highly probable that he might come back with the question, "Do you mean vines or fruit?" That sums up a situation that existed generally on coastal plain soils. If you ask him further, "Did you follow recommendations regarding the use of lime, fertilizers, and green manure crops?" don't be surprised if he says, "To the letter." So we may jump to the conclusion that "Old Man Weather" controls the yield of tomatoes.

But is that the answer? Is it a simple weather problem? Growers like to blame the weather, yet there are growers who year in and year out grow 10 or more tons of tomatoes to the acre regardless of weather. As a matter of fact, this season there are growers who produced 10 tons of tomatoes to the acre for the first time.

Yes, weather is a factor, but something can be done about it. If you look into the practices of the growers who grew only a crop of foliage and claimed they followed recommendations you find that they may have used enough lime and fertilizer, but they slipped up on some details that to them seemed unimportant.

If we were to list briefly some of the details that might be overlooked, we might get a clue to the small yields of fruit. These might be grouped under those factors that produced poor growth and consequently low yields and those that produced good vine growth but no yields.

Those factors that produced no yields, because of poor foliage, are self-evident, and we may list them briefly as soil acidity, poor drainage, insufficient plant food, insects, diseases, poor plants, poor tillage, low organic matter, and weeds.

Much Foliage but Low Yields

To list those factors that contributed to low yields with abundant foliage, we have to be more specific. Not too much fertilizer, but the method of applying the fertilizer, coupled with variety, contributed largely to over-vegetative fields. In a dry season this would not be a factor, because lack of water prevents efficient utilization of nitrogen. In a season such as prevailed in 1938, it is a very important factor. It is not enough to say that the tomato crop requires 75 pounds of nitrogen, 120 pounds of phosphorus, and 105 pounds of potash. We have to specify how those ingredients should be used, if we are to get ahead of "Old Man Weather."

There were many Rutgers and Marglobe fields in 1938 where all the nitrogen was placed under the plants that had prospects of 20 tons to the acre the first of August, and did not pick a single ton of tomatoes. Such varieties as Rutgers and Marglobe grown on a Collington loam or sandy loam in a high state of fertility, with 1,000 to 1,200 pounds of fertilizer under the plants, in addition to a coating of manure plowed under, will jump a rail fence in no time without taking time to set fruit. Yet that treatment has produced very good yields

In the 1938 season, 500 pounds of fertilizer produced a yield of 6 tons of tomatoes. Lack of plant food means poor plants and low yields.

in past years. Generally speaking, 1938 was a very wet year in spots. Abundant water, with good growing temperatures, produces foliage with any kind of fertilizer.

The Pritchard tomato, grown under similar conditions, produced a good crop of fruit in 1938 under New Jersey conditions, because it needs that kind of treatment to produce a big crop. It is a rich-soil crop, while Marglobe and Rutgers are poor-soil varieties, relatively speaking. On rich soil, Rutgers and Marglobe grow rapidly and may make too much foliage.

Need Balanced Nutrients

Abundant foliage means a manufacturing plant of large capacity. It should be a firm growth and should not be watery and wilt easily. Such foliage also has a heavy root system. Watery, succulent foliage, even though extensive, may have a weak root system which cannot meet heavy demands. Plenty of water, nitrogen, and optimum temperatures, with a poorly balanced supply of nutrients in the soil, produces soft, watery growth.

To use fertilizer nutrients to best advantage, every leaf must function efficiently. Good foliage is capable of manufacturing many pounds of sugar and starch, which is necessary to set the fruit and mature it. To work efficiently, every leaf should be in a position to receive sunlight. Crowding plants cuts down their efficiency through shading, and the result is not a partial crop, in accordance with the reduced amount of sugar, but no crop at all, because other factors destroy what little fruit did set.

What can we do about it? In a wet year we can plant farther apart, provided we know it will be wet. In a dry year plants may be planted close together, if we know it will be dry. Wide planting distances cause wastage in a dry year. Since we cannot tell what sort of weather we will have, it would seem that our solution is to control the growth of our plants by our methods of fertilization adapted to our varieties.

Rutgers and Marglobe are free-growing and respond rapidly to nitrogenous fertilizer. They must receive their nitrogen in small enough amounts to promote a growth that is not too soft. Frequent side-dressings of nitrogen and potash, with the phosphorus applied in the row or broadcast, have given very good results with these varieties.

Pritchard and Bonny Best types which are slightly earlier, but also good yield-

In 1938 1,500 pounds of fertilizer produced 15.6 tons of tomatoes. Vigorous vines on well-drained soils grow tomatoes regardless of weather conditions.

ers, need their nitrogen early. Side-applications of fertilizers do not give the response in these varieties. To obtain the largest yields, they must be given ample fertilizer early to make a heavy vine growth, which in turn will set fruit freely and mature a large crop. It seems peculiar that a Rutgers plant will set and mature 75 fruits on 500 pounds of a 5-8-7 fertilizer under the row early, while a Pritchard plant will require 1,200 pounds early to do the same thing. But that is the situation, and until our growers recognize that varietal differences with respect to fertilizer needs do exist, they will not grow consistently good yields in spite of the weather.

Tomato plants build up sugar and starch in their leaves and store it in the leaves, stems, and roots. They also take the nitrogen from the soil and by using up some of the starch made in their leaves they build protein. The more nitrogen they use, the more sugar is used up. In other words, at any one time there is a certain ratio between the carbohydrates (starch and sugar), and proteins (nitrogen). This has been called the carbon-nitrogen ratio of plants.

That this ratio is very intimately associated with the setting of fruit and yielding capacity of the plant cannot be denied. The amount of starch in a plant varies with the hours of sunlight the plant receives in 24 hours. Therefore, the nitrogen requirement must also vary to produce a balanced type of growth. Under our climatic conditions, we can only approximate these values with our treatment. However, we do know that a tomato plant growing in full sunlight in July probably will utilize 20 times the nitrogen that the same plant will use in full sunlight in the same locality in December. The same difference exists between bright and dull, cloudy weather.

No Potash—No Sugar

Potassium apparently makes it possible for the plant to manufacture sugar. No potash—no sugar! Deficiency symptons which we associate with potassium deficiency are in reality due to carbohydrate or starch deficiency.

As the efficiency of starch formation is reduced through potash starvation, plants become softer. If there is no starch there can be no cellulose, which means no stability to the plant. The stems are weak and get quite succulent. About 45 pounds of potash per acre are necessary to prevent carbohydrate defi-

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Growing Sweet Potatoes In South Arkansas

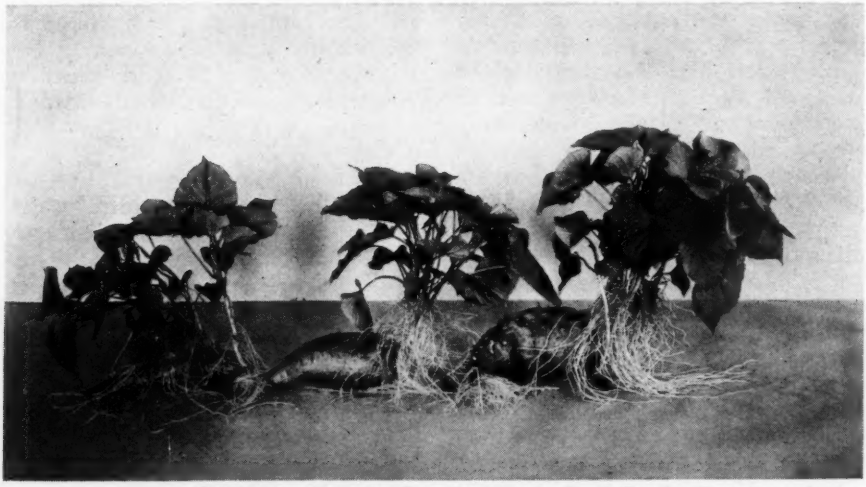
By G. W. Ware

Assistant Director, Fruit and Truck Branch Experiment Station, Hope, Arkansas

SWEET potato production is steadily increasing in Arkansas, the total production in recent years ranging from 3,000,000 to 4,000,000 bushels. Although this crop is generally grown throughout the State, the bulk of production is concentrated on the sandy soils of south Arkansas. The sweet potato is generally grown under field crop conditions, serving as a balance wheel in distributing farm labor, supplying food and feed, and providing additional farm revenue.

The Porto Rico and Nancy Hall are the only important varieties for home and commercial use, the former variety being preferred by the markets. It is highly desirable that only disease and insect-free seed be used for bedding. The Arkansas Plant Board now prohibits the sale of potato slips which have not undergone proper inspection, and the State is using higher quality slips than in the past.

The general practice is to bed small to medium-size seed potatoes, since roots from ¾ to 1½ inches in diameter produce more plants per bushel of seed and per square foot of seed bed than do larger potatoes. Five to six bushels of seed are required to furnish enough slips to set an acre at one pulling.



© "Southern Vegetable Crops," picture by South Carolina Experiment Station

Large, well-developed, hardy slips give best results. Sweet potato slips normally grow on the end attached to the vine, as shown.

It is recommended that the potatoes be bedded in March in well-drained, muslin or glass-covered, bottom-heated frames in order to produce large, stocky plants for early setting. The seed potatoes are placed close together, but not touching, and are covered with approximately 2 inches of sandy soil. The temperature of the beds should be held at 60 degrees Fahrenheit or above, either by natural or artificial heat.

© "Southern Vegetable Crops," picture by South Carolina Experiment Station

Cold-frames with bottom heat are recommended for producing large early slips.

The slips should be pulled when they have attained a height of about 6 inches, as large vigorous slips are more desirable than smaller ones. Planting in late April and early May is recommended for highest yields. Closer spacing, 12 to 15 inches apart in the row, is also recommended for early plantings in order to prevent "chunky" or jumbo potatoes which often result from the longer growing season when the plants are spaced 18 to 20 inches apart.

Fertilizer experimental work with sweet potatoes on the Ruston soils of the University of Arkansas Fruit and Truck Branch Experiment Station in south Arkansas, presents some interesting results as shown in the 5-year averages of table 1.

These results gave a computed relative value for the three principal elements as follows: nitrogen, 98; phosphorus, 85; and potassium, 101. This represents a ratio of approximately 1-1-1, and upon this information, a profit could be expected from the use of 500 pounds of 8-8-8 fertilizer when potatoes can be sold for as much as 60

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TABLE 1.—THE EFFECT OF DIFFERENT FERTILIZERS AT THE RATE OF 1,000 POUNDS PER ACRE ON THE YIELD OF SWEET POTATOES, FRUIT AND TRUCK BRANCH EXPERIMENT STATION, 5-YEAR AVERAGE.

Treatment	Grade	Average Acre Yield (Bu.)	Gain over Check (Bu.)
Check—No fertilizer	Marketable	64.90	00.00
	Culls	28.12	00.00
5–10–5 plus 10 tons manure	Marketable	188.82*	124.48
	Culls	45.38*	16.94
5–10–5	Marketable	172.77	107.87
	Culls	43.39	15.27
5–0–5	Marketable	117.61	52.71
	Culls	35.16	7.04
0–10–5	Marketable	109.19	44.29
	Culls	32.27	4.15
5–10–0	Marketable	107.38	42.48
	Culls	38.76	10.64

* Four-year average.

New Methods Help Tomato Growers

By E. R. Lancashire

Raw Products Specialist, Continental Can Company, Chicago, Illinois

IT HAS been my good fortune to know tomato growers in every part of this country and also to see them at their work. Tomatoes are grown for the fresh market in every State, and in 37 States tomatoes are grown for canning. How tomato growers harvest round, fully colored fruits instead of flat-sided, puffy, poorly colored fruits; how other farmers have eliminated the laborious task of growing seedling plants in hot-beds and cold-frames; and how still others have overcome the very serious handicap of the hot suns and blistering winds are examined as this story proceeds.

A Corn-Tomato Pioneer

Two years ago, a negro working on a farm near Dyersburg, Tennessee, was told to plant a few hills of field corn between the tomato plants as he hoed his way through the weeds. His appetite must have anticipated the savory meal which the job eventually promised, for contrary to his easy-going nature, or perhaps on account of it, he planted not a few kernels but a whole field of them.

The old Mississippi River had laid down an especially rich, black, level batch of corn-belt prairie silt, liberally mixed with sand which originated farther north. The negro scratched a hole midway of every two plants and entombed therein a couple of corn seeds.

The final results are all that count, and these were astounding. When the summer sun and winds had done their worst, there remained a 5½-ton per-acre yield of good, average quality, Tennessee canning tomatoes and a 30-bushel per-acre yield of ear corn which escaped the negro's appetite at roasting-ear time. The grower was well remunerated for his farmhand's zeal, and it was done on a sizeable field and not on a fraction of space in a backyard garden.

Skipping a year and a few States, we find ourselves way down in South Carolina on the farm of Walter Rawl. In the course of our visit, the story of the negro corn-tomato pioneer was told and partially believed. Once more a commercial planting of canning tomatoes was interplanted with corn at the last hand hoeing. Again the results were almost unbelievable. This time there was a 700-bushel pile of corn in addition to the best colored, earliest, and biggest yield of tomatoes grown in 1938 on this particular farm near Gilbert, South Carolina.

The hot sun and the devastating wind had been fooled again. Such results cannot be laughed away, strange as they may seem. The idea will spread in places where defoliation of tomato plants through disease attack, insect injury, or just plain run-down soil are contributing causes. And on the best of farms the scheme should work even better.

There was still another farmer near Trafalgar, Indiana, who had a fleeting idea of how to grow corn in a tomato field. Being in a sweet corn country he planted sweet corn and sold the roasting ears.

Late in September 1938, the tomato plants growing in the shade of the long-dead sweet corn plants were still vigorous of vine and loaded with plenty of large fruits. Needless to say, this farmer will really get down to business in 1939 and grow a man-sized patch of corn and tomatoes, and so too will many of his neighbors.

Tomatoes Need Shade

It has long been known that tomatoes grew redder, bigger, and more abundantly in the shade than in direct sunlight. It is only necessary to look at a crop of tomatoes growing on a north or a northeastern slope and then examine a field of tomatoes handled in identical fashion except for the fact that a south or southwestern slope was used. The odds are all in favor of the cooler slope.

Apparently, then, the shade is the thing. Tall corn provides the shade in a most efficient manner. To those among you who may be interested, it might be well to point out that a trial planting made in 1939 will cost but little and promises much. Whatever your usual planting distance may be, you have only to plant two kernels of corn between each two hills and let nature do the rest. Perhaps you can narrow a bit the wide difference in yield per acre which annually occurs between tomato fields in cool northwestern New York, where the average yield exceeds 7 tons per acre, and the smaller and smaller yields produced in States which are farther and farther southward and also westward.

Leaving the corn-tomato idea, let us examine the tomato-growing methods used by a farmer in the Lower Rio Grande Valley. Transplanting methods as ordinarily used in most places failed, and so he and his Valley neighbors annually plant 17,000 acres of Rutger's tomatoes by a "direct seeding" method, that is, the seedlings are "blocked out" by cutting out the surplus plants.

Many growers in California and Utah, and more recently in northwestern Ohio, northeastern Indiana, central Illinois, and central Pennsylvania, have gone into "direct seeding" in a large way. William Hertzel, Hicksville, Ohio, was the pioneer of this method in the northern mid-continental States. Today Mr. Hertzel will say he would

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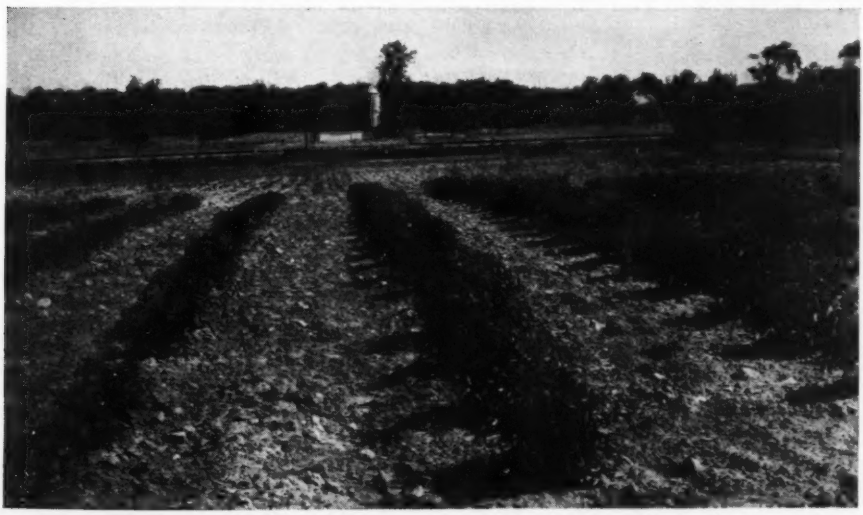

The rows on the left were seeded without a fertilizer attachment on the corn planter. The rows on the right were seeded and fertilized all in one operation with a corn planter of modern design which placed the fertilizer in a stream on either side of the tomato seed.

Improved Ginning Makes Better Cotton

By C. B. Sherman

United States Department of Agriculture, Washington, D. C.

A FARMER can use fertilizer to better advantage than usual, grow a better crop of cotton, pick it promptly, and then have his work spoiled in the ginning, if the gin is in poor condition, or if the equipment is lacking in any essential detail, or if it is not operated well. When cotton reaches the market, its quality is as much dependent on the way it has been ginned as on the variety of the cotton or the cultural methods that have been used.

Gin damage is chiefly in the form of sample preparation. This kind of damage is easily detected and is one of the principal quality defects that buyers complain about. So it is the one that is considered here.

A Stroboscope is used in observing the gin performance.

State and Federal men have long worked for the improvement of cultural methods and varieties, but only during recent years has it been possible for them to combine in a well-planned and concerted attack on the solution of practical ginning problems. Congress provided specifically for this attack by appropriating funds with which the Department was to investigate the ginning of cotton by establishing and maintaining experimental ginning plants and laboratories and by making tests and demonstrations of equipments and methods.

Studied Ginning Problems

When the experimental cotton gin and other necessary buildings and equipment were built and installed at Stoneville, Mississippi, the Bureaus of Agricultural Engineering and Agricultural Economics combined to get results that can be put into immediate and effective use. Moreover, they are cooperating with other Federal and State agencies and maintaining close relations with gin manufacturers, cotton breeders, and other agencies that can help, as was contemplated by Congress. Problems of ginning are many. One by one they have been systematically tackled at Stoneville, and one by one they are being solved in explicit terms that can be readily used by the ginners in action.

Damp cotton is one of the ginners' first troubles. Drying cotton by artifi-

Testing the moisture of a load of cotton with a hygrometer.

cial means is of great interest in the South today. At Stoneville different methods of drying were tested. Designs for new types of mechanical driers were developed, manufacturers were encouraged to put them on the market, and the results have been carefully watched. The best drier may turn out poor results, if it is not operated properly. The right degrees of heat to use under given conditions have been determined. Ginners are being urged to heed this question of temperatures, for the first enthusiasm for drying led to the belief in some quarters that if a little heat could accomplish such good results, a lot more heat would bring perfection. The fall of 1937 was so wet that the driers had a chance to prove their worth over a wide territory. About a million bales were dried by more than 550 driers in commercial gins.

Poor ginning usually shows up in such defects as naps, stringy condition, and roughness. If the ginner's investigations show that these defects were not caused by damp cotton, the next place to look for trouble is in the condition of the seed roll in the gin stand. Time was when these seed rolls were often expected to run through the season practically without adjustment. Now we know that using tight rolls instead of loose may lower the price of a bale from 60 cents for short-staple dry cotton to $4.50 for long-staple damp cotton. Ginners are now being told the best way to learn whether their seed rolls are right.

Then there is the question of gin saws. Are they worn? Dull? Is the tooth shape right? The pitch? If these points, or any one or two of them, are out of whack, they may tighten the seed rolls and they will decrease the ginning capacity. Stoneville shows the ginners that gin saws should be replaced before they are worn down as much as one-sixteenth of an inch. The other items have been checked in a similar way.

Lint-doffing System

Ribs are still making trouble. Stoneville is finding out how and why, and telling the ginners how to correct and prevent. But still more attention goes to the lint-doffing system, because when neglected it may bring severe lint dam-

age. The best approximate speeds for each size of brush and the range within which increases and decreases may be made with safety have been ascertained. Then the fact has apparently been established that no fixed ratio of speeds and saws is necessary, which simplifies the solution of the doffing problem considerably. Many other phases have been studied—condition of brushes and their set, fan speeds, position of nozzle.

In fact, the whole gin apparatus is receiving this detailed study—the proper setting of the seed, mote, and dividing boards and the results if the setting is incorrect; the correct timing of feeder speeds; the care of cleaning and extracting devices, lint flues, and condensers.

Response to the investigations at Stoneville has been immediate, but with something like 13,000 gins of every size and kind operating in the Cotton Belt, it will take a long time to get results known to all of them and a still longer time to get them all to try out the results themselves.

All kinds of extension methods are being used. Many States have gin extension specialists, or extension agricultural engineers, or extension agronomists working among the ginners and farmers. The Agricultural Extension Service of Louisiana was the first to put on a full-time cotton gin extension specialist and to develop a State ginning improvement program under the guidance of the ginning research laboratories at Stoneville. Far-reaching progress has been made in this work, which greatly increases the practical value of the experimental results. The ginners proved to be willing cooperators so that, within a year, official reports showed that the ginning situation in Louisiana was changing rapidly. There were many drier installations and other improvements, like installing the latest improved roll-box fronts and seed-roll dumping devices. To a considerable extent, the organization, set-up, and method of approach developed in Louisiana have been used as a pattern or model for the development and prosecution of the work in other States.

The cotton ginning improvement program in Texas is of especial interest because of its bearing on improving the quality of the cotton we export. In this

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In the fiber array laboratory at Stonewall, these workers arrange fibers according to their length. Variations in length result from different methods of ginning.

How Michigan Grows White Pea Beans

By E. B. Swingle

Michigan State College of Agriculture, East Lansing, Michigan

FARMERS in Michigan have the reputation of doing the unusual. So it can be accepted that Michigan's navy or "white pea bean" crop of 1938 is larger than the crop of 1937, although the total of all beans in the United States is nearly a million bags smaller.

Perhaps it is a new realization of the value of fertilization that has resulted in Michigan farmers consistently growing about 80 per cent of the navy beans in the United States. At one time, little thought was given to a bean plant's needs. Thrifty farmers who started the industry often remarked that beans were vigorous enough for the poorest soil, and so beans usually occupied the washed hillsides and the areas which already had been heavily cropped in grains and feed crops.

The first experimental work of staff members at Michigan State College concerning bean fertilization was in 1921. Fifty-seven farms in 18 counties, with 11 soil types, have added to the information since that beginning. Dr. C. E. Millar, head of the soils department, R. L. Cook, and J. F. Davis in summing up this period of experimentation find they still have problems, but at least they are able to make some recommendations.

They've scanned the response of beans to various fertilizer analyses, rates of application, and methods of application. Of one detail they are certain, the white pea bean may be taken for granted by Boston and the Navy, but as a plant it is about as touchy a plant-food consumer as can be found.

When bean fertilization became customary in Michigan, the usual methods were to apply and then plow, apply broadcast, or drill in when seeding a field. Years of experimentation out in the State produced a puzzle of results. In some years on some types of soil this fertilizer or that one seemed to prove practical and profitable. In other years or on other soils, at times it seemed as though the same fertilizer hurt the crop.

Threshing beans on the farm of William McAlpine, Fairgrove, Michigan.

Finally, the experiments with fertilizer placement brought out an apparent secret. Contact with the seed seemed to be a mistake. Through cooperation with the U. S. Bureau of Agricultural Engineering, an experimental bean

William McAlpine of Fairgrove, in Michigan's famed Thumb section, got 40 bu. to the acre from both Robust and Michelite, the latter the State's new white pea bean.

planter was designed and used on trial plats. This planter permitted placing the fertilizer at different depths in relation to the seed, also at different rates of application, and in bands alongside, underneath, or in contact with the seed.

Results began to come after this decision in early 1934. Yields indicated the benefits from fertilizers applied correctly in relation to the seed. From placement trials, the experimenters have concluded that band placement methods most promising were: "The placement of the fertilizer in a single band 1½ to 1¾ inches below the seed, and in bands 1½ inches out from the seed. In the applications at the side of the seed, a band on one side was as satisfactory as bands on both sides of the seed, and placing the bands deeper than the seed was more satisfactory than placing them on a level with the seed."

In the analyses ratings, the research continues. The men conclude that no single fertilizer analysis or grade is the best for beans on all soil types and in all seasons. Superphosphate alone proved an economical fertilizer on some soils, but for the average conditions of soil and weather encountered during these experiments, a fertilizer containing both phosphate and potash, as the 0-16-8, gave better results from the standpoint of yield and profit than did the superphosphate or the 4-16-8.

How much to use? In general, data show that applications greater than 300 pounds an acre were not economical. But work on that score is not completed. Tied in with this fertilizer placement work and the study of amounts and analyses, the indicator points to a greater study of green manure and simplifying applications by using fertilizer on the crop that goes into the soil to provide plant food for the bean plants.

Plowing under sweet clover green manure for beans gave very good results on two different soils in 1935. This, the research workers say, is in keeping with the idea that perhaps the best place to apply fertilizer for beans would be on the green manure crop preceding the beans rather than for the bean crop directly. This problem is being investigated further.

In the meantime the growers, by chance or otherwise, are hanging on to that navy bean or white-pea-bean-growing championship of the Nation. Acreage of the navy beans in Michigan in 1938 was 504,000 acres as compared to 485,000 acres in 1937. Production is estimated at 4,738,000 hundred-pound bags, or 940 pounds of marketable beans to the acre.

Fertilizing Asparagus In South Carolina

By A. B. Bryan

Editor, Agricultural Extension Service, Clemson, South Carolina

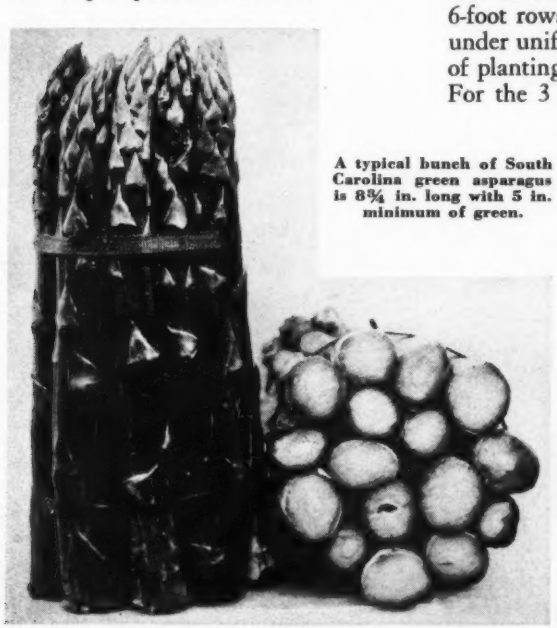
DIFFERENTIAL fertilizer treatments for asparagus at the Sandhill branch of the South Carolina Experiment Station during the past 4 years 1934-37 have yielded data of significance to asparagus growers in the southern States where soils and climatic conditions are similar. These data lead to the following conclusions:

1. There was no increase in yield or improvement in grade from the use of more than 5 per cent of nitrogen in the fertilizer.

2. When phosphorus was omitted there was a reduction in yield, but there was no increase when more than 7 per cent of phosphorus was used.

3. When potash was omitted, there was an immediate and significant lowering of yield and grade of asparagus, 5 per cent of potash being, it appeared, an efficient percentage of that element.

4. For varying amounts per acre of a 5-7-5 fertilizer 2,000 pounds per acre produced significantly greater yields and larger spears than 1,000 pounds per acre, but 3,000 pounds did not show significantly greater yields than 2,000 pounds.



A typical bunch of South Carolina green asparagus is 8¾ in. long with 5 in. minimum of green.

These fertilizer tests were made on a block of Mary Washington asparagus planted in 1929, under supervision of L. E. Scott, assistant horticulturist. The crowns were spaced 20 inches apart in 6-foot rows, and the planting was kept under uniform treatment from the time of planting until after the 1933 harvest. For the 3 years, 1931-33, yields of the individual plots were carefully taken. These preliminary yields were used in arranging the plots for the variable fertilizer treatments started in 1933, so that the group of three plots selected for one treatment had essentially the same average yield for the 1931-1933 period as the three plots for every other treatment.

The fertilizer treatment from time of planting until 1933 consisted of an annual application of a 5-7-5 (NPK) fertilizer at the rate of 1000

pounds per acre in 1929 and 1930, and 2000 pounds per acre in 1931 and 1932. In 1933 the different fertilizer treatments were started.

The effect of the uniform treatment during the 4 years 1929-33 continued for some time after the differential treatments were started. For this reason the results for 1937 in the case of some treatments are of greater significance than either the average results for 1934-37 or those for the first year or two after the uniform treatment was discontinued.

In comparing treatments, the basis of comparison was the performance of the 5-7-5 (check) treatment applied after harvest, with half of the nitrogen reserved as a side-dressing which was applied in July. This fertilizer consisted of superphosphate, sodium nitrate, cottonseed meal, and muriate of potash. One-sixth of the nitrogen was supplied in cottonseed meal with the remainder from sodium nitrate. Basic slag was substituted for superphosphate in one treatment.

Nitrogen and Phosphorus

The asparagus apparently could not utilize to advantage more nitrogen than that in a ton of 5-7-5 fertilizer. Hence increasing the nitrogen above that percentage showed no worthwhile advantage in yield or grade.

As to phosphorus, it is noteworthy that omission of this element did not affect the yield of asparagus for the first 2 years. But in 1936 there was an indication of a depressing effect, and in 1937 the downward trend was decided, the 5-0-5 treatment yielding 2,582 pounds per acre against 3,025 pounds for the check. The lack of response during the first 2 years indicates that the preliminary fertilizer treatment had built up a phosphorus reserve in the soil.

There was no definite effect on size of spears, over the 4 years, by the varying applications of phosphorus.

Where basic slag was used as the source of phosphorus, the yield was only slightly but consistently lower than that obtained when superphosphate was used. Acidity determinations showed a pH value of 6.6 for these plots as compared with 5.44 for the plots where superphosphate was used.

Results With Potash

"Omitting the potash from the fertilizer caused a decrease in yield that was observable the first year (1934) and that became more pronounced each succeeding year," says Mr. Scott. "In 1937 the yield from the no-potash treatment was 2,315 pounds per acre as compared with 3,025 pounds from the 5-7-5 treatment. The size of spears as indicated by the percentage grading Colossal was also greatly influenced by the lack of potash. When 5 per cent of potash was used in the fertilizer, the proportion of asparagus which graded Colossal was increased from 38.4 per cent (for the base period) to an average of 44.0 per cent for the 4 years, 1934-37, while there was a corresponding decrease from 47.7 per cent to 41.3 per cent in the case of the no-potash treatment. This was equivalent to a net gain for the Colossal grade, amounting to 12 per cent of the total yield, in favor of the 5-7-5 treatment. The high potash treatments (5-7-10 and 5-7-15) showed a tendency, particularly in 1937, to produce lower yields than the 5-7-5 treatment. The results are from unlimed soil. Data are not available as to the effects of heavy applications of potash on limed plots."

The effect of potash on yields and on percentage of yield grading Colossal during the 4-year period 1934-37 is shown in the following table:

Fertilizer (NPK)	Yield in pounds per acre Average 1934–1937	Percentage grading Colossal increase over 1931–1933
5–7–0	2,124.2	−6.4
5–7–5	2,495.1	5.6
5–7–10	2,374.8	6.3
5–7–15	2,385.6	1.3

It must be remembered that all plots received 1,000 pounds of 5-7-5 per acre in 1929 and 1930 and 2,000 pounds of 5-7-5 per acre in 1931 and 1932; and

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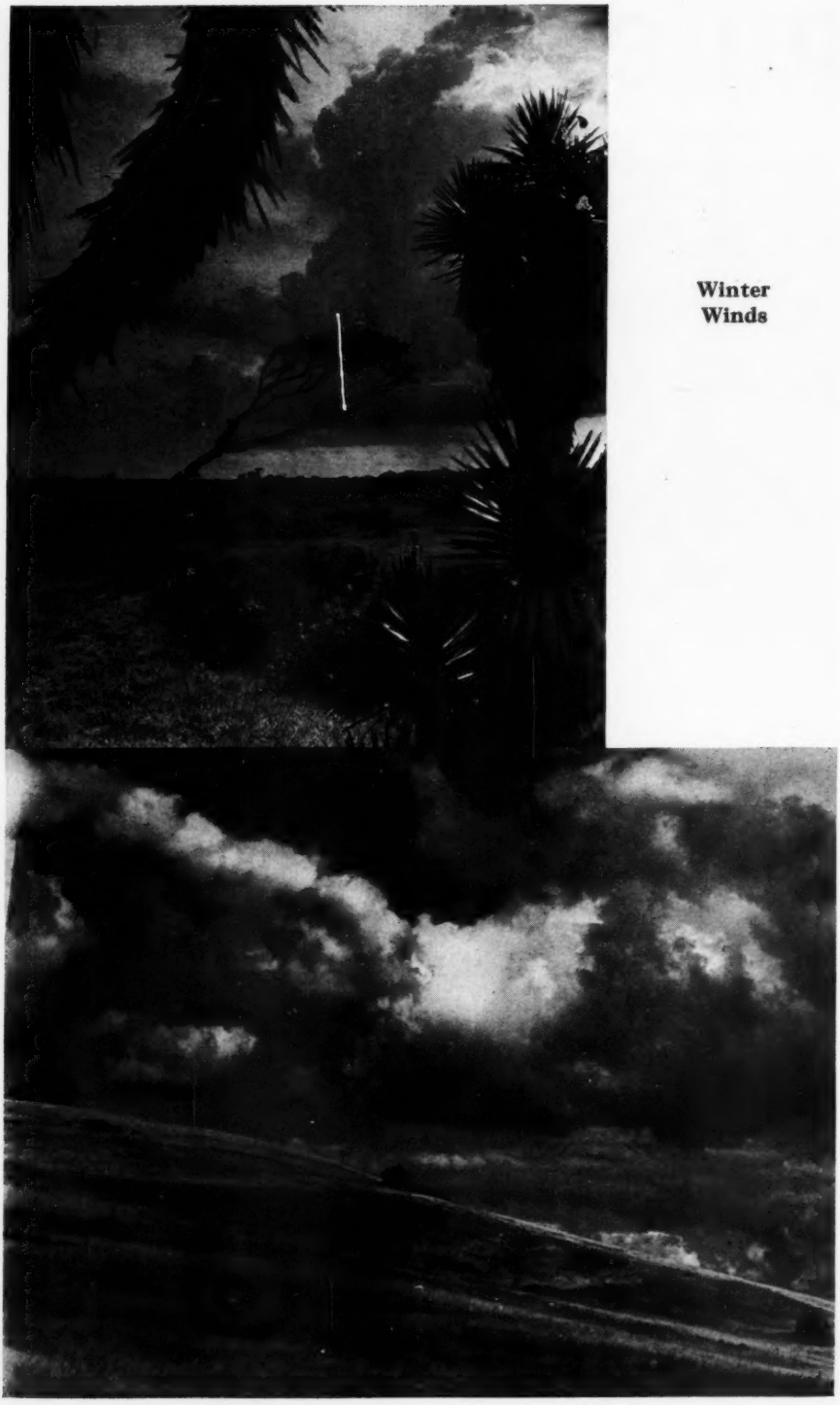
PICTORIAL

"In hopes that St. Nicholas soon would be there."



Winter Winds

Winter Calms

Above: The Northern Indiana Muck Crops Show held November 15-18 at Walkerton, Indiana, selected pretty Jeanne James of Winamac for their queen.

Below: Little Nancy Schumacher appointed herself queen of this showing of Clair Spotts' tobacco crop grown near Ephrata, Pennsylvania.

The Editors Talk

Merry Christmas

We come again to the time of year when store windows are rigged up for the dress parade, when streets are crowded with busy shoppers, when there are mysterious connivings at home—and mysterious smells come from the kitchen. It takes us back to the time when Christmas was the milestone in our year, the point to which and from which the rest of the year's happenings were measured.

And strange, the occasion has lost but little of its childhood fascination. Old familiar streets become glamorous in their seasonal finery, handshakes are a bit firmer, greetings more sincere. In fact, Christmas rejuvenates the best that is in us. Someone once said, "Clothes and manners of life may change, but Christmas is honored in men's hearts and its spirit is timeless."

The phrase-makers are forever trying to catch in words the spirit of Christmas. Trying to explain why, of all our celebrations, it is the one we never quite outgrow, or want to discard with our childhood. It is difficult to reconcile the vastness of the Christmas spirit to mere words. But outside, growing just by the window, a tree lifts its branches skyward in a gesture that embraces the full meaning.

The gratitude of growing things is the faith of all mankind. At Christmas especially, we are more than usually aware of our gift of life, aware of the lives that were lived that we might live, the lives that are to be because we have lived. And so, a bit more thoughtful than usual, and with hearts warmed by the evidence of Christmas on every hand, we extend to our many known and unknown friends a sincere wish for a happy holiday season, and may a good year be in store for you.

Looking Backward

As the year draws to a close, it is natural for one to review the hopes with which the New Year was ushered in and the accomplishments or failures incident to its passing. In this vein, it was of interest to us to turn back to the editorial "Looking Ahead" in the January 1938 issue of this magazine in which we dusted off the crystal ball and oiled up the "if-ometer" to see if we might foretell some of the things in store for American agriculture.

We note that we said the slowing down of industrial production would result in a decreased demand for agricultural products, but that reduced farm prices would offset, in part at least, the effects of this decrease in demand and that consumption would not fall in proportion to the drop in consumer purchasing power. We further predicted that increased agricultural production would have a stabiliz-

ing influence on farm income and that farmers' cash income would not decrease in proportion to the drop in prices.

We now find that farm prices have fallen about 19 per cent whereas the U. S. Bureau of Agricultural Economics has estimated that farm income will be from 10 to 12 per cent less than in 1937. The index of industrial production has increased materially within the past 4 or 5 months and is now about normal as compared to 84 per cent a year ago, and the volume of retail trade is showing improvement. This confirms the prediction that 1938 would wind up traveling in the opposite direction from 1937 with business activity and other important indices of economic conditions well above the so-called depression levels.

Here are some of the high spots of 1938—Cotton yields continued to maintain record levels, with 219.7 pounds per acre producing an estimated crop of 12,137,000 bales. A bumper wheat crop was produced at an average yield of 13.2 bushels compared to the 10-year average of 13.5 bushels. Farm income is estimated at $7,600,000,000 as compared to $8,600,000,000 in 1937. The curve of industrial production pulled out of its power dive about the middle of the year and began almost as steep an ascent. Factory payrolls have increased from 70.8 per cent of the 1923-25 average to about 85 per cent, whereas the monthly cash income of farmers over the same period has increased from 60.5 per cent to 87 per cent. Industrial production has increased from 76 to nearly normal. All of this has taken place without any material increase in the wholesale price index.

As we look back, we find 1938 fulfilling pretty well the hopes and predictions we had for it. The year closes on a basis on which the inspiration and hopes of the new year may be well founded.

David R. Coker

On November 28 the South lost one of its most important agriculturists. Tributes following the passing of David R. Coker at Hartsville, S. C., will fix in minds, not already cognizant of the great service of this man, the underlying vision of a greater American agriculture which dominated his interests.

Well-born and provided with the opportunities for an education, it nevertheless was Mr. Coker's own initiative which placed him among the leaders in science and business and won for him an honorary doctor of science degree from Duke University in 1930, law degrees from the University of North Carolina and the College of Charleston, and another science degree from Clemson College. He came into national prominence as a member of the National Agricultural Advisory Committee, of the National Agricultural Commission to Europe in 1918, and director of the Federal Reserve Bank of Richmond. He also was a member of the U. S. Commerce Department's Business Advisory Council.

Mr. Coker's personal business, "Coker's Pedigreed Seed Company," grew out of his interest in plant breeding which began in 1902. With an ideal of rebuilding the South into a prosperous agricultural section, he combined the results of his laboratories and experimental fields with sound business judgment in growing seeds of new and improved varieties of crops and the marketing of these seeds all over the world. The company experienced times of heavy financial losses, but the ideal behind it built an organization which now includes a large staff of scientific and business workers.

David R. Coker will be sadly missed, but his influence on Southern, national, and world agriculture will never cease.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ To the list of numerous new publications containing instructive information on the subject of fertilizers issued in recent months should be added the New Jersey Agricultural Experiment Station Bulletin 651, "Fertilizer Materials and Mixed Fertilizers," by A. W. Blair, and U. S. Department of Agriculture Circular 487, "Selecting Fertilizers," by A. R. Merz. General discussions on the different fertilizer elements, high analysis fertilizers, soil reaction due to the various fertilizer materials, and methods of application, among other related topics, are given in both publications. The New Jersey Bulletin, which supersedes Bulletin 541 published in 1932, contains specific recommendations for fertilizing crops of that State.

With the increased knowledge gained in the past decade on proper placement of fertilizer, more emphasis is being given to the economic advantage of purchasing higher grade fertilizers. Reducing freight and handling charges, made possible by the use of more concentrated fertilizers, without in any way lessening the efficiency of the fertilizer, helps materially in the program of reducing crop-production costs. Striking examples of how farmers in many States save on their fertilizer bill by purchasing fertilizers containing increased amounts of plant food per ton are cited in the U.S.D.A. circular. Merz points out that farmers in New York, New Jersey, and Georgia who purchased one ton of 10-20-10, instead of 2 tons of 5-10-5 that would have been necessary to furnish the same quantity of fertilizer elements, for instance, saved $10.15, $7.65, and $9.76, respectively. Comparing one ton of the high analysis mixture with 2½ tons of 4-8-4 represented a saving of $14.78, $13.03, and $16.19 in the respective States.

While farmers are generally aware of the danger of improper use of the "high powered" fertilizer, Professor Blair states that they should experience no trouble with it where good judgment is exercised. The key to success by way of obtaining the most from the more efficient fertilizers is in having the fertilizer properly placed in the soil, so that it does not come in direct contact with the seed. A considerable amount of literature on this important phase of fertilizer application is now available and is proving invaluable to countless thousands of growers and agricultural advisers. Consulting the above and similar publications should provide a far better understanding of the up-to-date principles with respect to selecting fertilizers.

¶ H. A. Lunt, of the Connecticut Agricultural Experiment Station, provides the reader with a host of interesting facts pertaining to the fertilizer requirements of the coniferous nursery stock based on extensive soil fertility investigations as summarized in Bulletin 416, "The Use of Fertilizer in the Coniferous Nursery." In view of the increasing need of reforestation in the production of timber and wood-pulp, and the demand for tree-planting in the soil conservation and flood control program, the author states that from the standpoint of the soil there are two problems

which must be faced. These are: 1. Increasing the productive capacity of old nurseries; and 2. Maintaining the productive capacity of new ones. Continued cropping, together with scarcity of manure, has in some instances created a real need for the use of commercial fertilizer to produce trees of average size, to say nothing of larger stock.

Under the conditions of these studies, it was shown that red pine and other conifers responded to the application of fertilizers, both in the seedbed and transplant-bed. Precaution must be taken, however, to avoid injury from too high concentration of soluble materials in fertilizing the seedbed. Nitrogen is absorbed in the largest amount and should be available in the soil in the ratio of 10 parts N to 4 of P_2O_5 and 5 of K_2O. One may conclude from the data obtained in these studies that on sandy soils where an adequate rotation cannot be used and where manure is difficult to obtain, the fertilizer for the first-year seedbeds should be supplied with 50 to 75 pounds of nitrogen per acre for pines, and 25 to 40 pounds for spruces. Phosphorus should amount to 20 to 25 pounds of P_2O_5 for pines and 20 for spruces; and potash, 25 to 30 and 10 to 15 pounds K_2O, respectively. For the second year, 100 to 150 pounds of N, 40 to 60 pounds of P_2O_5, and 50 to 75 pounds of K_2O are suggested. For the first-year transplant-beds, these amounts could be reduced by a third. In the absence of positive proof as to the merits of organic nitrogen over the inorganic forms, the author advises a mixture containing both forms.

It has not been possible through the use of fertilizers on these soils to shorten the time necessary for plants to remain in the nursery, but it has been possible to produce somewhat larger plants in the same period of time. These studies on nursery stock requirements and response to treatment are being continued, and according to the author, findings will be reported in later publications.

"Fertilizers for Different Crops Including the Best Percentages of Water-Insoluble Nitrogen of Totals in Fertilizer Mixtures," Agr. Exp. Sta., Raleigh, N. C., Cir. 107, April 1937.

"Tobacco Fertilizer Recommendations for 1939," Agr. Exp. Sta., Raleigh, N. C., Cir. 111, Aug. 1938.

"Fertilizer Mixtures for Different Crops (Home Mixing), Agr. Exp. Sta., Raleigh, N. C., Cr. 113, Sept. 1938, W. H. Rankin.

"Results of Potato Fertilizer Experiments at the South Carolina Truck Experiment Station, (A Preliminary Report)," Agr. Exp. Sta., Clemson, South Carolina, Sp. Cir. 3, Dec. 1937, J. M. Jenkins, Jr., and J. J. Mikell.

Soils

¶ A large number of references on soil erosion and soil and water conservation are contained in U. S. Department of Agriculture Miscellaneous Publication 312, compiled by S. H. Gaines with abstracts by F. Vincent, M. Bloom, and J. F. Carter. The title is "Bibliography on Soil Erosion and Soil and Water Conservation." This bibliography is intended primarily to assist students, teachers, and writers explaining the subject of soil conservation and related fields. Its scope is indicated by reference to the table of contents and list of citations by geographic regions. The volume contains more than 650 pages and covers upward of 4,000 individual citations. A large majority of the references deal with material published during the past 25 or 30 years, but not later than August 1937. Both popular and scientific references are included. Some 50 pages are devoted to an author index, thus making it comparatively simple to review subject matter contributed by known authors.

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"Surface Run-off and Erosion on Granitic Mountain Soils of Idaho as Influenced by Range Cover, Soil Disturbance, Slope, and Precipitation Intensity," U. S. D. A., Washington, D. C. Cir. 482, Aug. 1938, George W. Craddock and C. Kenneth Pearse.

"Legumes in Soil Conservation Practices," U. S. D. A., Washington, D. C., Leaf. 163, 1938, A. J. Pieters.

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"Anchoring Farmlands in the Ohio Valley Region," U. S. D. A., Washington, D. C., Soil Cons. Serv., Reg. 3, Revised July 1938, J. S. Cutler.

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Crops

¶ Tobacco farmers should be vitally interested in J. E. McMurtrey's explanation of diagnosing nutritional deficiencies which commonly affect the growth and impair the quality of the crop as outlined in U. S. Department of Agriculture Technical Bulletin 612 entitled, "Symptoms on Field-grown Tobacco Characteristic of the Deficient Supply of Each of Several Essential Chemical Elements." The nine elements considered are nitrogen, phosphorus, potassium, magnesium, calcium, boron, manganese, sulphur, and iron. Decreased growth results when the supply of any one is insufficient, and in certain parts of the plants characteristic effects are displayed which serve to identify accurately which of the essential elements is deficient, Dr. McMurtrey says.

Nitrogen deficiency is accompanied by a slowing down of the rate of growth, the plant showing a decrease in intensity of the normal green color. Firing and yellowing of the lower leaves are typical effects of nitrogen starvation. A lack of phosphorus is shown by a dark green color, narrow leaves in proportion to length, and the plant's failure to mature properly. Leaves from such plants are undesirable in quality.

A shortage of potassium is readily determined if the lower leaves of the plant show mottling or chlorosis at the tips and margins. This is rapidly followed by necrotic specking that usually spreads to most of the leaf tissues between the veins and results in a ragged appearance of the leaf. Portions of the leaf which are not disintegrated have a darker color than normal, with a bluish-green cast. The mottling due to potash deficiency usually progresses rapidly from the lower leaves to the upper leaves of the plant. The cured tobacco leaves affected by plants deficient in potash lack body, elasticity, aroma, ability to condition when exposed to moist air, and possess poor fire-holding capacity. Magnesium deficiency causes a chlorotic effect between the principal veins, producing a light green to almost white color in leaves; however, the leaf tips and margins show little or no crumpling as in the case in potash starvation. Many growers are familiar with the common disturbances due to magnesium deficiencies or sand drown, which is more prevalent in deep sandy soils and during excessive rainfall.

In general, the lack of the four essential plant foods described above affects the lower or older leaves of the plant and may affect the entire plant. A shortage of calcium, boron, manganese, sulphur, and iron affects the upper and bud leaves of the plant in the initial stages. A deficiency of iron, for example, may be noted as the young leaves are chlorotic or lack the normal green color. When this condition is accentuated, the leaf tissue becomes white or yellow. Boron deficiency results in a peculiar but typical twisted type of growth in the upper part of the plant. This is due to improper growth at the growing tip of the plant. The younger leaves of the bud are light green, the bases of the leaves being lighter in color than the tips. When the deficiency is acute, a characteristic dieback of the plant develops.

A color plate shows the appearance of plants lacking one of the nutrients, with a normal plant for comparison. The author has worked out a key whereby one is able to track down the nutrient most deficient, by observing the abnormalities of the plant.

¶ A grape breeding and testing program carried on by the Georgia Experiment Station for 29 years distinguishes it as one of the South's foremost authorities on this crop. In Bulletin 199, "Muscadine Grapes, Culture, Varieties, and Some Properties of Juices," M. M. Murphy, Jr., T. A. Pickett, and F. F. Cowart describe the characteristics of 13 varieties of the muscadine group that the Station has developed and in-

troduced during the past 20 years. These new types are superior in one or more respects to older varieties. The bulletin gives a summary of analytical data of the chemical and physical properties of expressed juices which were determined from a laboratory study of 35 varieties. Recommendations concerning cultural practice, spacing the male vines, training of vines, pruning, and propagation are also included.

Data on the influence of proximity and ratio of male vines show that bearing vines should not be over 50 feet from the male vines. Establishment of about 8 to 10 bearing vines for each male vine is recommended, and a chart showing an ideal planting scheme is given in the bulletin. The muscadine grape is quite difficult to root from cuttings, so that propagation by layering is a practical method.

An annual application of 300 to 400 pounds of 6-6-6 or similar fertilizer per acre is recommended after the third year. For the first year ¼ to ½ pound of the same fertilizer should be applied to each vine. Additional applications of ½ pound per vine are advocated during the second and third years about the middle of May and last of July. If the vines seem overly vigorous, the nitrogen content of the fertilizer should be lowered, or it may be increased if they appear lacking in vigor.

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Economics

¶ According to the bi-annual report of the North Carolina Department of Agriculture, Raleigh, North Carolina, "Fertilizer Sales by Grade in Order of Tonnage, January 1, 1938 to June 30, 1938," there was a decrease of 8.3% in mixed fertilizer sales within the State as compared to the corresponding

period in the previous year, and a decrease of 6.9% in total fertilizer sales, mixed goods, and materials. A brief analysis of the report discloses a number of interesting changes that have taken place within the past 2 years. On the mixed goods list, 3-8-3 decreased from 36% of the total in 1937 to 30% of the total in 1938, 3-8-5 dropped from 23% to 22%, whereas 4-8-4 just about held its own, and 2-10-6 increased from 1% to 3%, 3-8-6 from 3% to 4%, and 3-10-6 from 3% to 5%. Changes in consumption of mixed fertilizers affected plant-food consumption as follows: 28,347 tons of N, in the first half of 1937, 25,846 tons in the first half of 1938; 71,151 tons of P_2O_5 in the first half of 1937, 65,880 tons in the first half of 1938; and K_2O dropped from 37,109 tons to 35,565 tons.

The weighted average analysis of all mixed fertilizers sold in 1937 was 3.2-8.1-4.2, and the corresponding analysis for 1938 was 3.2-8.2-4.4. The total plant-food content in all mixed fertilizers in the first half of 1937 averaged 15.5%, whereas in the first half of 1938 the average was 15.8%, an increase of 2%. Perhaps the most significant feature of the 1938 fertilizer season was the fact that in a depression year the average analysis of all fertilizers sold increased and the relative importance of the so-called low grade fertilizers actually decreased. This is contrary to the popular belief that in years of declining farm income the relative importance of the lower grade fertilizers which are priced lower per ton tend to increase.

¶ According to the annual fertilizer control bulletin, "Commercial Fertilizers in 1937-38," published by the Texas Agricultural Experiment Station, the total sales of fertilizers for the 1937-38 season were 79,640 tons, or about 5% less than for the corresponding period in the previous year, when sales amounted to 84,938 tons. The 1937-38 figure is still considerably above the 1935-36 tonnage of 60,016 tons. Practically all of the sales of mixed fertilizers in Texas in 1937-38 were confined to about 20 different analyses. The four leading grades in order of their importance are 4-8-4, 4-12-4, 4-8-6, and 6-10-7, with tonnages of 18,743, 10,345, 8,107, and 4,901 tons respectively. These 4 grades represent 52% of the total sales of all fertilizers.

¶ Of special interest this month is the changed form of the fertilizer consumption report, published by the Fertilizer Statistical Division of the Bureau of Inspection, Florida Department of Agriculture. In the old form, fertilizer consumption data were published monthly. The data furnished were by counties, but there was no breakdown in the total tonnage figure itself. In the new report, "Consumption of Mixed Fertilizers by Counties of Florida for Month of September, 1938," both mixed fertilizers and materials are broken down, and the data are still published by counties. The new reports will furnish a cross-sectional picture of Florida fertilizer consumption, and should in the future prove to be a valuable asset to those interested in the fertilizer industry.

¶ An interesting analysis of the changes in prices of hired farm labor, feedstuffs, and fertilizer materials in New Jersey has recently been published by the New Jersey State Department of Agriculture as Circular No. 293. In this circular Mr. D. T. Pitt, Agricultural Statistician, has presented figures showing the changes that have taken place in the price levels of these three important items which enter into the farmer's cost of production. Since about 1920 the average wage paid to workers by New Jersey farmers has been considerably higher than for the nation as a whole. The combined index of the three items covered in the circular began its decline in 1930 when the index stood at 156. By 1933 it had dropped to 93 in successive jumps from 122 in 1931 and 100 in 1932. In 1934 the trend was reversed, and the index began to move upward. In 1937 it reached 132 or about 32% above pre-war, i. e., the 1910-1914 average. However, fertilizers showed relatively little increase, and were still only 91% of the 1910-14

average, as compared to 152 for hired farm labor, and 129 for feedstuffs. The low point for hired labor came in 1933 when the index stood at 119, for feedstuffs in 1932 when it was 68, and for fertilizer materials in 1932 and 1933, both averaging 74.

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"Statistical Results of Cooperative Extension Work, 1937," U. S. D. A., Washington, D. C., Ext. Cir. 286, June 1938, M. C. Wilson.

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"The Dixon Springs Land Utilization Project, Charting Better Land Use in the Central States," U. S. D. A., Washington, D. C., 91021, 1938, L. E. Sawyer and John R. Clifton.

"The AAA Plan for Bright Tobacco," U. S. D. A., AAA, Washington, D. C., 38-Tobacco-50, Nov. 1938.

"An American Income for Corn," U. S. D. A., AAA, Washington, D. C., Gen. Inf. Ser., G-92, Oct. 1938.

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Sweet Young Gal (in parlor): "Mamma! Mamma! Come here and make Dick stop teasing me!"

Mamma (from stairway landing): "What is he doing, dear?"

Sweet Young Gal: "He's sitting on the other end of the davenport."

The homely girl approached the information desk at a tourist park and asked for a road map. The obliging clerk gave her one.

"Thank you, I hope I won't go wrong," the girl said sweetly.

"With a map like that," retorted the attendant, "I don't see how you can."

Specialty Farming Depends on Markets

By E. N. Bressman

U. S. Department of Agriculture, Washington, D. C.

THE POSSIBILITIES in the field of specialty crops might on first consideration appear almost limitless since there are some 250 different common drug plants alone that might be grown. Actually, however, the possibilities are limited by the small and indefinite market that exists for most of these plants. Most specialty crops have been exploited or propagandized at one time or another, and it cannot be too strongly emphasized that prospective growers should not become too enthusiastic about the possibilities of rare or little-known ones.

There is, however, no desire to discourage prospective growers in cases where there are real possibilities of successful production, an assured market, and fair returns. In the specialty field, a grower need not limit himself to plants used exclusively in drugs, for there are many related plants that have uses in the manufacture of drying oils, insecticides, and related fields. In recent years possibly the greatest interest has been in plants yielding drying oils and insecticides, such as soy beans, safflower, pyrethrum, and nicotine tobacco.

There are several established growers of crops of relatively minor importance, such as spearmint, peppermint, wormseed, ginseng and goldenseal. The possibilities for new growers in the production of these crops, however, are definitely limited.

At present many of the plant products that go into drugs are imported. Chemists and industrialists interested in producing every possible agricultural product in this country, noting these products on import lists, have time and again set them up as having real agricultural possibilities. A few years ago a drug manufacturer stated that under certain conditions there were 50 different drug plants that could be grown in this country. There was little evidence, however, that any of the plants he had in mind could be profitably grown in this country.

Several New Crops

There are a number of miscellaneous crops of sufficient value to warrant an investigation of their possibilities in the United States. Two comparatively new crops that might find a place in the drying oil industry are perilla, adapted in the South and Southeast, and chia, apparently somewhat adapted in the Southwest. Likewise, there are two crops that have shown some possibilities in tannin production. They are canaigre, in New Mexico and Texas, and sumac in the South. For perfume oil, roses, lavender, and clary sage in the Pacific Northwest and West, and rose geranium in Florida and southern California have been under consideration. There are a number of species of Ephedra that are being investigated for alkaloid content. The adaptation of this crop to areas of low moisture and poor soil makes it of particular interest. One of the newer plants thought to have value as an insecticide is commonly known as Cracca and devil's shoestrings. This leguminous plant, which grows wild throughout the East and South, has in some localities been found to contain a fairly good yield of rotenone in its roots.

It is extremely important that any prospective grower of botanical crude drug plants, such as digitalis, belladonna, and aconite, should get in touch with one of the various large wholesale drug concerns dealing in these products before embarking on their production. Many concerns have very strict requirements as to the kind and quality of materials that they use, also as to packing and handling. Because of the variation in these products, no standard package or bale is available for all drugs. It must be remembered that in some cases the whole plant is desired, whereas in others, it is the leaves, stems, or rootstocks that are wanted. Some plant products are purchased solely on the basis of their drug content and others on the basis of their appearance. Naturally, it would be desirable to pay only for the actual drug content of a plant, but in many cases this is difficult to determine. In the case of pyrethrum, purchases were formerly made entirely on the basis of appearance, but there is now a great tendency to make purchases on the basis of the pyrethrin (poisonous principle) content.

Fluctuating Prices

Prices of drug plant products fluctuate violently. Overnight they might be reduced 50 per cent or increased to 300 per cent. This is sufficient reason for any grower to require some sort of specific agreement or contract for his crop. Certain drug plants require more than one year to come into production, and in the case of many perennials, it is not profitable to grow them unless the crop can be harvested for several years after it is established. No one would wish to establish a permanent crop on a price basis that might change overnight. In other words, the production of this sort of plant is risky unless an assured market is established before any kind of production is undertaken.

Many roots, herbs, barks, and leaves are gathered from the wild by farmers. There are various centers for this sort of collecting. In the southern Appalachian Mountains, in the vicinity of Asheville, North Carolina, and in southwest Virginia there are important centers for collecting, and several of the large wholesale drug houses have warehouses in these places for the purchase and storage of certain products. In the mild coast area of the Pacific Northwest, many drugs are collected from indigenous plants, including the world's supply of cascara bark, an important cathartic drug. Another area for wild plant collection might be found in the New England States.

Medicinal Plants

In Miscellaneous Publication No. 77 of the United States Department of Agriculture there are described 128 different American medicinal plants of commercial importance. These range all the way from aletris, a grass-like herb, the rootstock of which is used in drugs, to yerba santa, a tarweed, the leaves of which are used in the drug trade. Some of those listed are used only in limited quantities, but others are in fairly constant demand. Among the latter group may be mentioned black cherry, bloodroot, boneset, burdock, cascara, catnip, ginseng, goldenseal, jimson weed, mayapple, pokeberry, sassafras, snakeroot, tansy, and wormseed.

It is well to remember that every crop has an optimum environmental condition. No one condition is satisfactory for all plants. There is great variation in requirements of heat, moisture, shade, and soil conditions. Many plants will not stand the warm, humid conditions found during the growing season in some parts of the South. On the other hand, plants of the non-hardy type will not survive winters of low temperature. As a whole, specialty crops are not attacked to any great extent by diseases or insects, although each has some sort of enemy—a leaf-spot, fungus, borer, leaf-eater, rodent, or other pest. Still, growers of specialty

crops run all the risks of growers of staple crops, and in addition, have far more specific requirements to meet as regards the quality of the crop produced.

In general, a grower of specialty crops must be a specialist. Although training in chemistry is not essential, it is desirable, since it helps the grower to appreciate proper handling of his plants, particularly after harvesting, in order that the greatest amount of valuable principle may be retained. In many ways the specialty crop grower is like the seed grower. He must produce a quality product if it is to find a ready and profitable market. Wheat, corn, and cotton even of inferior quality usually find a market of some sort, but there is no assured market for specialty crops of just any old kind, poorly harvested and cured. In many cases specialty crops of poor quality find no market and are a total loss.

Potash Puts New "Kick" In Iowa's Alkali Soil

BY applying potash fertilizers to their "sick," alkali soils, farmers in nine northern Iowa counties this year boosted their corn yields around 13.5 bushels per acre and their income —over fertilizer costs—around $4 per acre, on the average.

The fertilizer demonstrations were carried on in Hamilton, Webster, Humboldt, Wright, Winnebago, Emmet, Palo Alto, Pocahontas, and Kossuth Counties by 35 farmers cooperating with the Iowa State College Extension Service. Bruce Kilpatrick, Iowa State College extension agronomist, supervised the demonstrations.

Five types of fertilizers were used: 0-20-0; 0-20-10; 0-20-20; 0-9-27; and 0-0-50. The first four were applied with planter attachments at corn-planting time at a rate of around 125 pounds per acre. The fifth was applied with cultivator "side-dressing" attachments at 100- and also 200-pound rates after the corn developed symptoms of potash starvation.

The fertilizers applied with planter attachments (except 0-20-0, which contains no potash) increased the yield an average of 12.5 bushels per acre and the value of the crop over fertilizer costs, $3.72 per acre. The 0-20-20 and 0-9-27 were most effective on the more alkaline and 0-20-10 on the less alkaline soils.

In the cultivator applications, the 0-0-50 fertilizer increased the yield an average of 14.5 bushels per acre and the value of the crop over fertilizer costs $4.10 per acre. In one individual case the corn yield was increased 48 bushels per acre, resulting in a profit and value over fertilizer costs of $21.93, Kilpatrick reports.

"Every year since potash demonstrations were started about 10 years ago, applications of potash fertilizers on 'hot' alkali soils have consistently given profitable returns," Kilpatrick says. "Last year the value of potash was demonstrated even more strikingly than this year."

Not only does the fertilizer increase the corn yield, but also the percentage of marketable corn.

Addition of potash fertilizer is necessary on alkali soils because potash naturally present seems to be locked up in an insoluble form. Corn plants which do not get enough potash either die or develop stunted stalks, marginal firing of the leaves and small, chaffy ears. Annual applications of potash fertilizers are recommended, since experiments have shown that with heavy applications intended to last for several years soon the potash seems also to become "locked up."—*"Better Iowa" Dec. 5, 1938.*

Building *for* Productiveness

By C. B. Williams

Agronomist, North Carolina State College of Agriculture, Raleigh, North Carolina

ON THE part of operators of the farms of North Carolina, since the farm income of the State is very largely from the production of crops, one of the greatest essentials is that of securing economically moderately large yields per acre. To do this, certain factors, largely under the control of farmers, will have to be looked after carefully, viz., proper cultivation of the crops, including preparation of the land; use of improved and adapted planting seed of high viability; the practising of proper systems of crop rotation, using in the rotations suitable legumes for soil-improving purposes; and the use of proper kinds and amounts of fertilizers and lime when and where needed. It is well to bear in mind that the growers' failure to look carefully after all of these essential factors will generally result not only in reduced yields, but products of less than the highest qualities.

For instance, as an average of 17 years of field experiments at the Piedmont Branch Station in Iredell County on a dominant soil series of the Piedmont region of North Carolina in an average state of productiveness to begin with, the use only of proper preparation of the soil and cultivation of the crops coupled with the use of good seed and the practise of a good four-year rotation of crops including the growth of and plowing under of legumes have given only 157 pounds of seed cotton, 6.7 bushels of corn, 0.5 bushels of wheat and no yield of red clover hay per acre. When each respective crop was fertilized with suitable complete fertilizer mixtures, the yields per acre were on an average 1,095 pounds of seed cotton, 27.0 bushels of corn, 14.4 bushels of wheat, and 788 pounds of red clover hay. When both lime and complete fertilizers were used, the yields were 1,350 pounds of seed cotton, 45.9 bushels of corn, 20.7 bushels of wheat, and 2,853 pounds of red clover hay per acre.

Favorable Growing Conditions

So it seems that for this typical red clay loam soil providing some of the factors essential for goodly crop yields and leaving others unprovided for will not bring profitable yields. These same kind of results will be the outcome in other parts of the State where the soils are poor or only moderately productive. In other words, providing only part of the essentials for moderately high to high productiveness of crops will always result in small yields, except on a very limited number of soils which are in excellent physical condition and are high in available plant nutrients. These latter soils for a time and with good cultivation usually will produce good yields during normal seasons, but sooner or later they will wear out.

In the light of the above facts, if farmers of North Carolina and the nation generally are to get the most out of the efforts and money which they put into the production of their crops annually, they will have to make their soils more productive by making all essential controllable factors just as favorable for crop growth as it is economically possible to do.

Legume Gets Two-Thirds Its Nitrogen From Air

THE amount of nitrogen added to the soil when legumes are turned under depends on the kind of legume, the condition of the stand, and the stage of growth. A. J. Pieters and Roland McKee, of the United States Department of Agriculture, discuss the subject in "Soils and Men," the Department Yearbook for 1938.

The amount of nitrogen in a legume when turned under, they point out, represents the nitrogen it has taken from both the soil and the air, but the amount taken from the air is all that is really added to the soil. The relative amounts derived from each of these sources are difficult to determine, and it can only be stated that as a broad average about two-thirds of the nitrogen in a legume is believed to have been taken from the air and one-third from the soil.

An extra 2 or 3 weeks of growth in spring may double the nitrogen value of a winter cover crop. A winter crop of hairy vetch in Alabama had a nitrogen content of 137 pounds to the acre on April 19 and a little more than 200 pounds on May 9. In Delaware crimson clover crops varied from 140 to 190 pounds of nitrogen to the acre. In North Carolina sweet-clover supplied 124 pounds of nitrogen in early April and 160 in late May.

These results are roughly parallel, and the authors translate them into practical fertilizer terms. The amounts of nitrogen added in these cases would have been equal, they say, to the application of 600 to 800 pounds of nitrate of soda to the acre.

Legumes Improve Mississippi Soils

(*From page 8*)

pounds of bur clover seed were sown in Mississippi last fall. One delta planter harvested 40,000 bushels of bur clover seed to supply the demand, and operated his own harvester with a capacity of 1,000 bushels of seed a day.

As a result of the increased production of winter legumes, Mississippi farmers have added millions of dollars to their farm income. The 1928-32 5-year average yield of cotton was 185.6 pounds per acre. Paralleling the expansion in legume acreage, the average yield of lint cotton in Mississippi was 194 pounds in 1933, 214 pounds in 1934, 218 pounds in 1935, 304 pounds in 1936, and 369 pounds in 1937. This increase in cotton yields is probably without equal in the history of a major farm crop in the United States.

In Coahoma County, where acreage in winter legumes was increased from 20,000 acres in 1933 to 60,000 acres in 1937, the yield of cotton was increased from 223 pounds for the 1928-32 average to 530 pounds, or more than 1 bale per acre in 1937. Despite somewhat unfavorable weather this year, County Agent Harris Barnes estimates that Coahoma County will average 400 pounds of lint cotton per acre this season. Similar results have been obtained in all

other counties where legumes have been grown extensively.

The acreage planted to summer legumes has also increased during recent years. For example, Mississippi farmers interplanted 450,000 acres of corn to soybeans in 1937 compared with 95,000 acres in the 1928-32 5-year period. Acreage of corn interplanted to cowpeas was increased from 134,000 acres in 1928-32 to 477,000 acres in 1937. Acreage in alfalfa for hay increased from 27,000 acres to 75,000 acres; cowpea hay jumped from 80,000 to 180,000 acres; and soybean hay increased from 116,000 to 229,000 acres.

More farmers are becoming interested in proper fertilization of winter legumes. The Mississippi Experiment Station recommends around 200 pounds of superphosphate or 400 to 500 pounds of basic slag, and from 50 to 100 pounds of muriate of potash or its equivalent, applied before planting. Of course, where the fertilizer is not applied under the legumes, it should be applied before planting the following crop when the legumes are plowed under.

The experiment station recommends for cotton 500 pounds of complete fertilizer carrying from 4 to 8 per cent potash. For hill land of medium to high fertility, 500 pounds of 4-8-4. Hill land with low fertility, 500 pounds of 6-8-4. For all bottom and second bottom land, 4-8-8 and 6-8-8. On bottom land of medium to high fertility, 4-8-8, and for low fertility, 6-8-8.

On the Gulf Coastal soils the station recommends for cotton, 6-8-4 and 6-8-8, depending upon the amount of potash deficiency of the soil. For all truck crops, the station recommends the application of around 1,500 pounds of a complete fertilizer analyzing from 4 per cent to 8 per cent potash. At present, the station recommends nitrogen only for corn, with the exception of the Gulf Coastal area where a 6-8-4 is recommended. However, records of farmers who produce high yields as well as those of 4-H club boys show that most of them use a complete fertilizer before planting and side-dress heavily with nitrogen.

The delta foothills have been found to be very deficient in potash, and the station's recommendation for this section is 24 to 36 pounds of nitrogen, and 24 to 48 pounds of K_2O, or potash. This

Cotton following bur clover produced 2 bales of cotton per acre.

amount of potash is equivalent to 50 to 100 pounds of muriate of potash per acre.

There are areas of flat lands in the State, including the area around Grenada, Forest, and other areas, which are very deficient in potash and where 8 per cent of potash is needed in the fertilizer. There is also a considerable area of sandy hill land where cotton rusts, and this land should have around 8 per cent potash in the fertilizer.

Growing Sweet Potatoes in South Arkansas

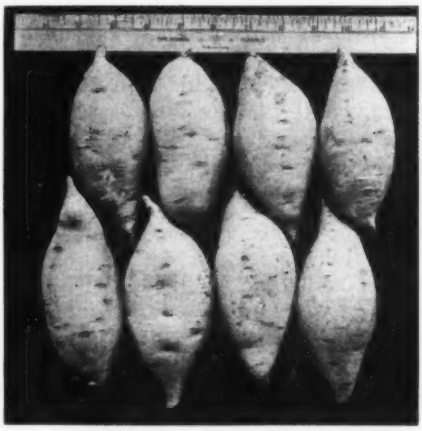
(*From page* 13)

cents per bushel. Such a fertilizer can be provided by applying 500 pounds of 4-8-4 before planting, and by side-dressing with 125 pounds of nitrate of soda or its equivalent, and 40 pounds of muriate of potash when the slips have become well established. The main application of fertilizer should be thoroughly worked into the soil several days before planting, and the side-dressings should be worked into the side of the beds.

The experiment also showed that the highest percentage of culls was produced on the unfertilized treatments, and the next highest on the 5-10-0 treatments. The lowest percentage of culls was grown on the complete 5-10-5 treatments.

Although manure gave some increase in yield, the additional cost did not justify its use.

Sweet potatoes should be given the usual row cultivation often enough to control weeds. Two hoeings and several plowings are generally made before the vines interfere with the cultivators. Moving the vines for later plowing is believed to be unprofitable, and vine pruning to stimulate root development is of questionable value.



© "Southern Vegetable Crops," picture by South Carolina Experiment Station

The Porto Rico, leading moist-fleshed variety, produced by a well-balanced fertilizer.

New Methods Help Tomato Growers

(*From page 15*)

quit growing tomatoes before he would go back to the old transplanting method.

On a farm south of Urbana, Illinois, tomato-grower Clark took a two-row corn planter, with fertilizer attachment and broom corn plates, and on the afternoon of May 8, 1937, planted 9 acres of Illinois Pride tomatoes. It had been a wet spring and the rain began again just as he finished drilling the field. It rained off and on for the next 3 weeks.

It was June 1 before the soil was dry enough to cultivate, and on that black, fertile, prairie soil of central Illinois the

weeds took things over in a big way. The field was a sea of weeds in which farmer Clark had planted 6 pounds of tomato seed.

Clark got out the corn plow and first plowed with the rows and then across them. He had left a square foot of weeds several inches high at the place where he wanted each tomato hill to be. With a good, sharp hoe he thinned out each hill, leaving only one tomato plant. It cost Clark $4.00 per acre to hand-hoe the hills, figuring the labor at 25 cents per hour.

To make the story short and to the point, Clark's yield was 8½ tons per acre. Never in his life before had he been able to produce such a yield.

Direct Seeding Successful

"Direct seeding" has come north to stay, for strange as it may seem, there were 1,000 acres or more of it in Indiana and Ohio in 1938. These tomatoes were planted during the last part of April and withstood a killing frost on May 13. This frost killed transplanted tomato plants in the same territory.

"Direct seeding" does not slow up the date of first harvest, and neither does it result in speeding up the early death of the vines. Yields of "direct-seeded" tomatoes and the quality of the fruit are equal to any produced by the older transplanting system.

The method is not fool-proof. Weeds and run-down soil and insects make results of the system uncertain. However, these hazards are controllable and will not stop the spread of "direct seeding."

The details of the job as worked out by Mr. Hertzel include

1. Selection of well-drained, fertile soil.
2. Fall plowing clean-cultivated fields for the tomato seedbed.
3. Building up organic content of soil.
4. Thorough fitting of seedbed and seeding one month ahead of normal plant-setting time.
5. Drilling on each acre ½ pound of treated seed ¼ inch deep.
6. Setting drill to space seeds one inch apart in rows.
7. Keeping field free of weeds by means of a rotary hoe operated at high speed.
8. Keeping soil crusts from forming by using a rotary hoe.
9. Dusting or spraying for flea beetle control if necessary.
10. "Blocking out" to desired stand.

It would seem that in the States where the average yield of tomatoes is less than 5 tons per acre, "direct seeding" or interplanting corn between the tomatoes, or both methods used in the same field, should offer a practical way of reducing the cost of tomato production. Since very few States can boast of an average yield exceeding 5 tons per acre, these two new developments will very likely find widespread usefulness in places where they have not already been introduced.

It is of little use to grow cheaper tomatoes if the color is poor or the fruits are puffy and flat-sided as was the case on the farms of Mr. Hinton near Reedsville, Virginia. The sandy soils of the coastal plain respond most generously to proper treatment.

Corrected Leather-neck

Mr. Hinton was able to correct the puffy, poorly colored, leather-necked condition of his tomato crop by the addition of organic matter and a liberal supply of a high-grade chemical fertilizer. He first proved to his own satisfaction that organic matter was absolutely essential, and next he discovered that leather-necked fruits showing greenish yellow stem ends and puffy, flat-sided fruits could be corrected by using the right amount of potash in the fertilizer.

Time was when neighbor Hinton grew 2 or even 3 tons of sickly tomatoes per acre, but for the past few years a 10- to 12-ton per-acre yield of fine quality tomatoes has become an established custom. Tomatoes cannot take care of

themselves, much as some folks would like to see it that way.

Skill in the many tricks of the tomato-growing trade will always be essential. If the old, time-honored methods have failed you, and you are not satisfied with the results, there seems no other way out than to try a new method or quit the business.

Perhaps the shade created by a corn plant may be enough deviation to turn the trick. "Direct seeding" will help you further reduce the cost of tomato production. You will at least have a crop of corn in case of a tomato failure. And the correct use of fertilizer will further improve both the quantity and quality of your marketable tomatoes.

Fertilizing Asparagus in South Carolina

(*From page* 22)

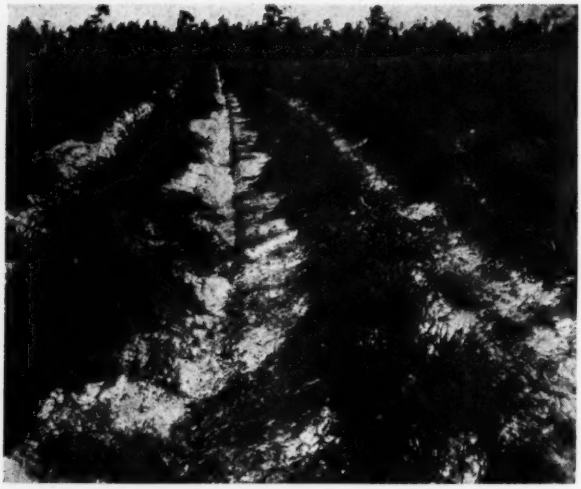
that the applications in 1934-37 were 2,000 pounds of the formulas in the table.

When sodium nitrate, ammonium sulfate, and a combination of these two materials were each used as the source of nitrogen in a ton of 5-7-5 fertilizer per acre on unlimed soil, the average yields for the 4-year period were not significantly different; however, the yield from ammonium sulfate exhibited a downward trend the last 2 years. There is the possibility that this trend was due either to the increasing soil acidity or to a deficiency of potassium, or both. Where sodium nitrate was used as the source of nitrogen, a portion of the requirement for potassium may have been supplied by the substitution of sodium for potassium. When ammonium sulfate was used as the source of nitrogen, part of the potassium requirement may have remained unfilled, resulting in reduced growth and yield.

These generalizations are further supported by the fact that large and successful asparagus growers in South Carolina are increasing farm uses of additional potash on asparagus with very beneficial results, as was recently reported in an article by John Miley appearing in the April 1938 issue of *Better Crops With Plant Food*.

A pronounced and immediate effect of the no-fertilizer treatment was, of course, to be observed. In 1934 the yield from this treatment was 2,054 pounds per acre against 2,603 pounds for the 2,000-pound application. The difference became greater each year until in 1937 the yields were 1,214 and 3,026 pounds per acre, respectively. In the case of the 1,000-pound application the difference was also marked, the yield from this treatment gradually decreasing until in 1937 it was only 2,150 pounds per acre. When the rate of application was increased from 2,000 to

Dr. J. B. Norton, noted plant-breeder, examining a good hill of Washington asparagus.



A field of good "grass" after harvest season. Note the light, sandy soil.

3,000 pounds per acre, the total yield was not significantly increased.

The no-fertilizer treatment produced much less of the Colossal grade in 1937 than the 2,000-pound application. Spear size in the case of the 1,000-pound application did not decrease so rapidly or to such an extent following the discontinuance of the preliminary treatment. The 3,000-pound treatment produced no significant increase in total yield, but there was a noticeable improvement in the grade of the asparagus from this high analysis fertilizer.

Varying the time of application of fertilizer produced no significant differences in yield. Applications were made (1) all before harvest, (2) all after harvest, (3) half before and half after, (4) several divisions of the fertilizing elements before and after—eight different schedules, but using the same total amount of plant food in each case. Neither yield nor size of spear showed any pronounced differences because of varying the time of application.

A 1,500-pound per acre application of dolomitic limestone did not affect significantly the yield of asparagus in this experiment.

No significant effect upon yield or grade resulted from the removal of the tops of the asparagus in the fall as compared with leaving them until spring.

Improved Ginning Makes Better Cotton

(*From page* 18)

program the improvement of the ginning is a vital link between the production of improved varieties and improvements in the marketing of cotton through which farmers may realize the full value of their lint and seed. Every ginner in the State has been reached through the inclusive series of meetings held for 2 years in all cotton-growing sections. Special meetings have been held for both farmers and ginners. Ginners have recognized their important position in preserving the value of the cotton produced by the farmers. They have given it consideration in every meeting of the Texas Cotton Ginners' Association since Stoneville has been in a position to recommend the most suitable methods of ginning.

Bringing groups to Stoneville for direct contact is a favorite method of spreading results. Among other groups last summer, the extension specialist from Missouri brought 50 men—farmers, ginners, and extension workers—for a 2-day learning and inspection stay at Stoneville. About 30 gins that handle about one-third of the State's

crop were represented. Besides seeing the layout and work, they visited nearby commercial gins that are using Stoneville's results in their daily ginning. Evening meetings were held for discussions.

When the Mississippi Cotton Ginners Association met at Stoneville this year, it attracted ginners from Texas, Georgia, Alabama, Tennessee, Missouri, Arkansas, and Louisiana. About 500 people visited the ginning and fiber laboratories, and more than 300 took part in the business sessions. The Texas delegation, 50 strong, had held a meeting of its own there the day before, coming in an "autocade" from every section of Texas except the lower valley.

The theory back of all the work is that to put a better crop of cotton on the markets we need to work with the ginners just as much as with the farmers. It is a joint problem in which each group bears responsibility. Improvement of ginning is of equal interest to farmers and ginners, and improvement in varieties grown is proving to be of as much interest to ginners as to farmers. Both are interested in getting a product that will be more readily marketable.

A resolution passed by the last convention of the Georgia Cotton Ginners' Association convincingly stated the mutual interest of farmers and ginners in the general program for the production and marketing of better quality cotton and endorsed the recommendations for improvements developed at Stoneville. The more rapidly the people in both groups recognize the mutual nature of their problems and the necessity for mutual understanding and effort in solving them, the sooner we shall have complete success in the production of American cotton.

Does Weather Affect Tomato Yields?

(*From page* 11)

ciency from appearing. That does not mean that this is enough potassium. Within the range between 45 pounds and the 105 pounds, which we consider sufficient for a fair yield, occur a number of growth conditions that may be considered more or less normal as far as appearance of the foliage is concerned, but are wholly inadequate from the standpoint of producing good fruit. Chemically we know this deficiency is insufficient carbohydrates.

We find the maximum amount of carbohydrates manufactured where 45 to 50 parts per million, or 90 to 120 pounds of potassium per acre are available to the plants. Increasing the potassium slightly beyond that amount has little effect in changing carbohydrates. If it were doubled we would again find our carbohydrate curve dropping, but this we cannot attribute to a lack of potassium. It is, however, carbohydrate deficiency, and is brought about by other causes which we call physical. This brings up another idea, i. e., the ratio of potassium to other ions plays a very important part.

In studies conducted at this station, it has been found that there seems to be a certain ratio between potassium and calcium which affects the quality of growth. Too little available calcium causes dying-back of the tips of the plants and dying of the roots. Forty parts per million of calcium are sufficient to prevent dying of the plants but do not promote a good type of growth. The foliage is soft and succulent, and increasing potassium beyond that needed by the plant tends to accentuate the softening effect by increasing water requirement. Increasing the calcium increases the dry matter or decreases the succulence of the plants by decreasing the water requirement. In short, cal-

cium has a hardening effect, while potassium has a softening effect. One counteracts the other. It would seem reasonable, therefore, that potassium deficiency would show up more quickly on a highly limed soil. That is actually the case. The effect of too much lime can be counteracted by increasing the amount of potassium.

Correct Ratio Necessary

When figuring any ratio between calcium and potassium, we must not use so little potassium or calcium that we produce deficiency symptoms. We are concerned with the physical effect of the calcium and potassium ions on the protoplasm of the cell. This effect influences the efficiency with which the cell can do its work. We are assuming, of course, that the plant is exposed to other environmental factors at optimum values.

Too much calcium in the soil solution may prevent potassium from being taken into the root if the level of potassium is not high enough. Likewise, too much potassium may prevent the plant from taking in sufficient calcium, if calcium is too low. Therefore, best results seem to be obtained with a ratio of approximately 6 or 7 parts of calcium to 1 part of potassium.

In a series of plants all receiving 20 parts per million of calcium and increased potassium, the severity of the calcium deficiency symptoms increased as the potassium was increased. Where twice the amount of calcium was supplied, deficiency symptoms of calcium did not occur but potash deficiency symptoms did occur. Therefore, it seems that if we are to get the most out of potassium, we must be assured of a good supply of calcium, and then supply potassium accordingly.

It has been shown that abundant calcium may bring about boron deficiency symptoms, and that this deficiency is often corrected with potassium applications. This may be a case of more boron being supplied with the potassium, or it may be due to the fact that increasing the potassium prevents calcium from being taken into the plants as freely.

Environmental factors have a tremendous effect on the utilization of all fertilizer ingredients. In a series of experiments on varying amounts of potash, 105 pounds of potassium gave the best results. The yield was 10.8 tons of tomatoes per acre. In another experiment the same amount of potassium gave 16 tons of tomatoes when the plants were mulched, and again, increasing amounts of potassium above 105 pounds per acre did not change the yield. These fields were similar from the standpoint of pH and rapid soil tests. At the present time we do not have data for tomatoes from high calcium fields to know whether more potassium would be nec-

Potash deficiency symptoms on tomatoes: Left—Hollow, ribbed, irregularly ripened fruit; leaves yellowed with greenish-tinted veins. Right—A healthy tomato leaf and fruit.

essary to obtain the same yield. From laboratory results it would seem that more potassium is necessary as the calcium level increases, but soil moisture, aeration, and similar factors undoubtedly affect the availability of potassium. Applications of lime have their effect. As a result it is difficult to say how much potassium should be put on the soil to give maximum results. All we can do is to supply the plants with enough so that if weather conditions permit, they will not suffer from potassium deficiency. Potassium deficiency means soft, weak plants which are not capable of producing large yields.

December's Embers

(*From page* 5)

boys of no ancestry, and followed by yellow dogs of no pedigree—that was the age of independence and nonchalance. It was likewise the era most barren of any consciousness of Christmas.

We knew full well where the "old man" got his dough and perhaps how little would be left over for holiday joy after the everyday groceries were secured. We sometimes had day-dreams beneath some blossom-laden apple tree, starring aloft at floating air-castles among the wafting clouds. Each of us knew he was "father of the man to be," and realized it was our last great recess before the signal bell of adolescence and the first job. Not much time in those days for saints or Christmas myths. It was the period of renunciation and disdain, yet made tender and livable by family ties and dreams of future enterprise and knightly valor.

I'M sometimes kind of sorry for that kid; he had so much sturdy faith in himself and the world and opportunity and destiny, and a lot more stuff harder to swallow than Santa Claus. At least, that's the way it looks to me and the mirror now. He thought he was renouncing fairy tales and entering the gates of go-get-'em, fit as a fiddle and out to win! He was putting away childish things, to see as his elders saw. He wasn't hanging up no socks no more. He was out to hang up a record!

Then finally in the course of life's cycle he met the girl who was willing to take him for what he appeared to be on casual acquaintance under favorable social circumstances. Thereupon old Christmas ideas crept back to warm his heart and plague his meager resources, in trying to match the bewildering "for her" lists with the state of his stipend. It was not such a tough job seen in retrospect, however, as she was sweetly appreciative of the gift for love's sake, and counted each dollar saved as so much more for the hope chest.

In substance, this reawakening of the original holiday theme under the urge of youthful, ambitious, home-planning hearts is the vital link which keeps alive the spark from dead pasts to vivid futures. Whether we realized it or not, we were high priests dedicating the lighting of fresh family altar fires. I wish the storekeepers always felt this way and saw to it that their gifts for brides and grooms were marked down a little! Maybe we should create a new federal "authority" to take care of that.

The first Christmas eve with the first baby marks another epoch among one's cherished moments. There was not always much else to make merry with, especially if maternal grandma insisted on trotting the infant on her lap every time it cried—which meant successive shirt-tail parades for you on chilly winter nights of long wails and short slumber. But at least you were not knocking at somebody's overcrowded inn, and your credit with the milkman was good enough for a small discount.

Later as the tots became toddlers you

assumed the secret role of Santa yourself, just as your father had done with even less to do with. It began with cautious excursions in company with your wife to size up the shelves and store windows. Sometimes you slipped aside at the toy counter to count your change against furtive purchases for each other, doubtful of their intrinsic worth but certain of their ultimate cheerful acknowledgment.

THOSE were the days of rancid cigars, wrinkled neckties, no-go wrist watches, and cheap perfume bottles. But after all, those beautiful presents pictured in the de luxe magazines were not meant for a subordinate clerk with two babies, a yawning furnace, and a heavy mortgage.

It was a time for slaying economic dragons, with just a little time out for holiday mirth. But you took it in mighty measure all the same, up there in the tiny flat, or maybe on the eighty-acre rented farm. You forgot the dreams of fish-pole days and settled down in earnest to face the world as it came along, sure of the helpful handclasp of the finest little lady since Mary of the Manger!

So then we said, "Come, my friends, smuggle those mysterious bundles into the house through back door or cellar window; hide them in locked drawers or leave them for awhile at the neighbor's until the time arrives when the little tree shall be trimmed and the inquisitive children unwillingly shall be forced to bed. Tune in the radio to make Christmas carols loud enough to muffle the rattling of the paper parcels or the squeaking of those unhappy toy dogs while you are busy doing the honors expected by the expectant ones.

"Stoke the furnace again, wind the clock on the mantel, pat the lumpy stockings as they hang there in a row in the ghostly firelight, count your limping bank account once more for the tenth time, and then heave yourself on the mattress. You won't need to set the alarm clock on Christmas morning—young voices and pattering feet will be your reveille."

If as the years go by and children vanish, one manages to acquire a little surplus revenue, then once more a chance arrives to brighten some Christmas tree in memory of bygone family tapers. Too often we neglect the opportunity to enlarge our holiday sphere and fail to do those kindly, helpful things which glorify this season or any season. The absence of familiar reminders and ancient associations should not deter us from indulging ourselves and others less fortunate in a bit of holiday happiness. Crabby old folks who forget it's Christmas because their children are gone are worse off than miserable bachelors, and with less excuse.

AND lastly, Christmas renews our courage and cements our resolves. It may have started as a pagan feast with apoplectic appetites and drunken revels. But it has softened and matured as the years have passed, touched by many tender customs and devoted sacrifices, so that regardless of what altar we seek or how many candles we light, the Christmas season is a treasure to us all.

Dedicated mainly as a toast to humble lives and common mortals, the chorus swells into a universal anthem, sweeping us all into a human unity not found on any other notable occasion.

In the North the snow falls and icebergs form on street and farmstead. In the South the palm trees wave and the breath of summer still remains. But among us all alike a spirit moves which neither soils nor frosts nor race nor creed can overcome. Thus once a year at least we all are one and speak a common language, and our password at the portal of the Lodge of Love is always "Merry Christmas!"

COLLABORATORS

At a luncheon of newspaper men the following toast was offered:

"The ladies! Second only to the press in the dissemination of news!"

Jake—"Just between you unt me, Herman, vot you tink of Lena Schuitzel?"

Herman—"Between you unt me, not so hot, Jake, but alone, oh poy!"

"What the deuce are you doing down there in the cellar?" asked the puzzled rooster.

"Well, if it's any of your business," replied the hen, "I'm laying in a supply of coal."

Tobe: "See hyah, woman! Didn't Ah see you kissin' a no-count piece o' trash las' night?"

Liza: "Gwan, Tobe. It was so dark Ah thought it was yo'."

Tobe: "Come to think of it, mebbe 'twas me—what time was dat?"

"Well, Willie, your sister has given herself to me for a Christmas present. What do you think of that?"

"That's what she done for Mr. Bunker last year, an' he give her back 'fore Easter. I bet you'll do the same."

Little Myer, after hearing so much talk about prosperity and depression, asked his papa:

"Papa, vot is de deefrance from prosperity and depression?"

"Vell, my boy," papa replied, "in prosperity ve had vine, vimmin, and song, but in depression all ve got is beer, momma, and de radio."

FOR BREAKFAST

"See that? It's a heron."

"Goodness. I've never seen one before—only kippered."

A cow has got two legs in front and
two more in addition,
To help hold up her chassis, her rear
end, and transmission.

In the hills of Arkansas, a son was born to one of the natives. As he grew from infancy he never spoke a word and his parents raised him as a deaf mute.

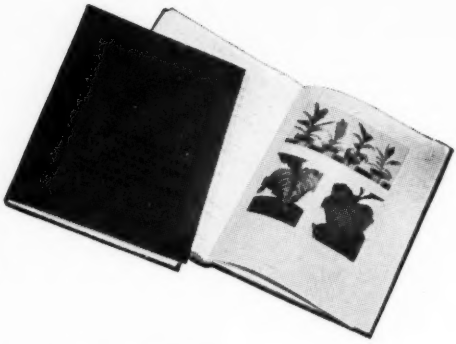
One day the father was bent over at his work in the orchard and did not notice that he was directly in the path of an enraged bull.

"Look out, Pa," the son shouted. "Here comes the bull."

The father ran to safety and expressed his joy his son had found his speech.

"Well, Pa," the son replied, "I just ain't had nothing to say before."

POTASH DEFICIENCY SYMPTOMS



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